

The Canadian Medical Association Journal

Vol. 51

TORONTO, NOVEMBER, 1944

No. 5

SOURCES AND MODES OF VENEREAL DISEASE INFECTION IN THE ROYAL CANADIAN AIR FORCE

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RECOGNIZING that close co-operation between service and civilian health authorities in the investigation and follow-up of alleged contacts was essential in the effective control of venereal disease, the R.C.A.F. Medical Branch introduced, early in 1941, a routine system of collecting and transmitting information on all venereal disease cases, alleged contacts and the *facilitation process*.

Immediately upon the diagnosis of every new case, the attending medical officer is required to interview the patient and to collect and record the required facts on a special confidential venereal disease report form developed for the purpose—form R.C.A.F. R.233, Venereal Disease Report. One copy of this form is retained by the unit and copies are passed to the hygiene officer of the command in which the individual is carried on strength, to the division of venereal disease control of the provincial health department in the province concerned, and to Air Force Headquarters.

Under this arrangement necessary facts regarding cases, alleged contacts and modes of infection are made available, immediately diagnosis is confirmed, to all four medical agencies concerned—the unit medical officer, the command hygiene officer, the provincial venereal disease control authority and the Venereal Disease Control Officer at Air Force Headquarters.

The R.C.A.F. has thus undertaken the task

of securing confidential information from all venereal disease patients in order that vital epidemiological data may be obtained and necessary investigations made by civilian health authorities. Certain questions naturally arise concerning this undertaking. Is the time and effort involved justified by the results obtained? Does the program justify its continuation? With a view to providing an answer to these questions and in order to secure basic facts concerning the principal aspects of the problems of contacts and the facilitation process, a study was made of 1,764 consecutive confidential venereal disease reports received at A.F.H.Q. during 1943. The salient findings are reported herein.

COMPLETENESS OF REPORTS ON SOURCE AND FACILITATION

The principal objective in reporting alleged contacts is to supply sufficient information to enable alleged contacts to be identified, examined and brought under treatment. An evaluation of the information furnished on the venereal disease report forms was therefore made from the standpoint of whether recorded data were sufficient to enable contact follow-up to be effectively carried out or not.

Each venereal disease report was reviewed by one of the authors (R.M.A.) and classified in one of three groups according to whether the recorded details of alleged sources of infection were *complete* or sufficient for the location of the alleged contact, *incomplete* but probably adequate for the location of the alleged contact, or quite *inadequate* for any contact investigation. While the yardsticks employed were not as clear-cut as was desirable, since it was not possible to check on falsification of information, the results of follow-up work done during the period covered by the report reviewed, support the validity of the statistical data presented in Table I regarding the limitations in contact reporting during the period of study.

TABLE I.
COMPLETENESS OF CONTACT REPORTS

Reports	V.D.S.	V.D.G.	Chancroid	V.D.S. & V.D.G.	Total cases	% No.
Complete...	41	629	2	4	676	38.3
Incomplete.	30	295	1	2	328	18.6
Inadequate.	52	703	2	3	760	43.1
Total....	123	1,627	5	9	1,764	100.0

In 38.3% of cases, reports were found to contain sufficient details for the location of the alleged contact. In 43.1% of cases the information was quite useless for contact investigation. A further strategic point demonstrated was that the inadequacies in reporting were most marked in those areas in which the venereal disease problem is most serious.

These facts show that there is considerable room for improvement in reporting. It is to be kept in mind, however, that even under ideal conditions, all deficiencies cannot be made good. Quite commonly the desired details concerning alleged contacts are just not obtainable. At the same time it is true that a good part of the observed deficiencies, however, can be eliminated by a keener appreciation of the problem and the objective on the part of all medical officers.

It is most important that the figures in Table I should not be misinterpreted. Most of the reports, even those designated "inadequate", contained valuable information regarding the facilitation process, even though they were inadequate in respect of data on alleged contacts.

FOLLOW-UP CONTACTS

An encouraging degree of success has attended contact finding of civilian health authorities on the basis of information supplied to such authorities by R.C.A.F. medical officers in venereal disease reports (R.233). This statement is substantiated by several samples of follow-up reports which have been examined during the past year.

Examination of the most recent group of 140 consecutive reports, covering a period late in 1943, showed that in 91 instances (65%) the alleged "source" was located and examined.

Of the 91 alleged sources located and examined, 40 were found to have gonorrhoea, 12 had syphilis, 2 had both gonorrhoea and syphilis, 34 were found not to be infected, and in the remaining 3 cases the diagnosis was in doubt.

While 34 cases were reported not to be infected, it is noted that in many cases re-examination was to be undertaken and in several instances therapy was being given.

TYPE OF CONTACT

Somewhere in the community there is at least one contact associated with the infection of any patient. These alleged contacts (sources of infection) may be divided into two broad classes: prostitutes, and all other (*clandestine*) sources. In this study, brothel inmates and streetwalkers (fee-paid) were included in the prostitute group. A tabulation of contacts by type for each group of infection is given in Table II.

TABLE II.
ALLEGED CONTACTS—BY TYPE

Type of contact	V.D.S.	V.D.G.	Chancroid	V.D.S. & V.D.G.	Total cases	% No.
Prostitute...	16	108	0	0	124	7.0
Pick-up....	99	1,481	5	9	1,594	90.4
Not stated..	8	38	0	0	46	2.6
Total....	123	1,627	5	9	1,764	100.0

In only 7.0% of the infections in this series were prostitutes named as alleged contacts. For the United States Army,¹ British Army,² Australian Army,³ United States Navy,⁴ and the U.S. Army Air Force,⁴ the casual "pick-up" or amateur has been reported to be responsible for 72, 80, 85, 77 and 80% of infections respectively. This fact, the relatively small part played by prostitute contacts (as defined), is important in designing control measures. A successful attack on the venereal disease problem in the R.C.A.F. requires the control of clandestine sources of infection.

Attention is directed, however, to the fact that the incidence of syphilis among individuals, for whom the alleged contact was specified as a prostitute, is significantly higher than that for other contacts (P is < 0.01). The implications of this observation are obvious—prostitutes are the most serious spreaders of syphilis in the community.

While the statistical evidence presented suggests that prostitution is relatively less important than other sources of infection, evidence was adduced in this study that prostitution was most important in those areas in which the incidence of venereal disease is highest and the venereal disease problem most serious. Where

prostitution is eradicated as a source of infection, a sharp and sure reduction in the incidence of venereal disease is most certain to result.

AGE AND OCCUPATION OF ALLEGED CONTACTS

Reported ages of contacts are not true chronological ages but the estimated ages reported to the medical officers by infected personnel. One-third of all alleged contacts were reported to be under 20 years of age; 15% were 25 years of age or over.

Waitresses, office workers, factory workers, domestic help, prostitutes and housewives were of importance as alleged contacts, in that order. This distribution has many implications in respect of the facilitation process.

GEOGRAPHIC DISTRIBUTION OF SOURCES OF INFECTION

A study made of places (municipalities) of exposure reflected the fact that several large municipalities are responsible for a disproportionately large number of the cases. Excluding cases arising outside of Canada, alleged contacts in ten large municipalities (with 25% of the population of Canada) were responsible for 60% of all the cases reviewed.

Control of venereal disease in the R.C.A.F. is rendered more difficult by the frequent posting of personnel from one unit to another during training. In addition to this, however, infection during periods of leave may take place in a command other than the one in which the parent unit is located. The observations made in the following paragraphs illustrate the extent to which this occurs.

A group of 321 cases allegedly contracted their infection in municipality A. This group of infections included personnel, not only from the command wherein this municipality is located, but from *all* commands. Indeed 13% of the cases in X command, 24% of the cases in Y command and 6% of the cases in Z command originated in municipality A. This fact demonstrates the problem which any highly infected area may create not only for the surrounding area or province but to distant districts or provinces.

A further effective demonstration of this point is given by Table III, wherein is given a distribution of 1,764 venereal disease cases by command and province or area wherein the infection was reported to have been contacted.

TABLE III.
PLACE OF INFECTION AND PARENT COMMAND

Area in which infection contacted	Parent command						Total
	A	B	C	D	E	F	
British Columbia..	3	1	0	3	0	74	81
Alberta.....	5	7	0	80	5	3	100
Saskatchewan.....	3	71	1	78	6	2	161
Manitoba.....	5	159	3	9	14	7	197
Ontario.....	290	12	63	10	44	7	426
Quebec.....	55	10	212	8	130	6	421
New Brunswick.....	2	0	12	0	76	2	92
Nova Scotia.....	0	2	4	0	148	1	155
Prince Edward Is.....	0	0	0	0	33	0	33
Newfoundland.....	0	0	3	0	11	0	14
United States.....	28	6	2	1	16	4	57
England.....	1	0	1	0	5	1	8
On train.....	4	0	2	1	4	0	11
Not stated.....	0	3	0	0	3	1	8
Total.....	396	271	303	190	496	108	1,764

These figures show that personnel in any command are infected in provinces and areas in some instances many hundreds of miles away. Conversely, sources of infection in one province or area spread disease widely, across the nation, among members of the forces.

THE FACILITATION PROCESS

The spread of venereal disease in a community is facilitated by certain conditions which make it easy for healthy persons to meet and expose themselves to infected persons. Where this facilitation factor is present, it is essential to obtain information, as a basis for the initiation of effective action, to correct the community conditions facilitating the spread of venereal infection.

PLACE OF CONTACT (MEETING)

The places of contact (meeting) for the two groups of contacts, prostitutes and others, based

TABLE IV.
PLACE OF MEETING—813 CASES

Place met	Prostitute	Pick-up	Not stated	Total	
				No.	%
Street.....	7	158	5	170	20.9
Dance hall.....	4	110	1	115	14.1
Hotel.....	5	102	5	112	13.8
Restaurant.....	2	101	0	103	12.7
Bawdy house.....	48	0	0	48	5.9
Night club.....	0	22	1	23	2.8
Others*.....	0	156	1	157	19.3
Not stated.....	1	79	5	85	10.5
Total.....	67	728	18	813	100.0
%.....	8.3	89.5	2.2	100.0	

*Includes theatre, bus, park, etc.

on a consecutive series of 813 cases, are given in Table IV.

Street encounters rank first in importance. Dance halls, hotels, restaurants and bawdy houses follow in that order. In 30.7% of cases tavern sites (night clubs, hotels and dance halls) were the places where initial contact with the alleged source was made.

PLACE OF EXPOSURE

Places of exposure by type of contact are shown in Table V.

TABLE V.
PLACES OF EXPOSURE IN 1,764 CASES

Place of exposure	Prostitute	Pick-up	Not stated	Total	
				No.	%
Hotel.....	19	606	8	633	35.9
Private house or apt.....	7	306	24	337	19.1
Outdoors....	1	295	2	298	16.9
Rooming house.....	19	241	4	264	15.0
Automobile..	1	88	0	89	5.0
Bawdy house.	66	0	0	66	3.7
Cabin.....	2	39	1	42	2.4
Others*.....	0	9	0	9	0.5
Not stated...	9	10	7	26	1.5
Total.....	124	1,594	46	1,764	100.0

*Includes theatre, bus, park, etc.

Hotels were named as the place of exposure in 35.9% of cases. Exposures in private homes, apartments and rooming houses comprised 34.1%. In 16.9% exposure occurred outdoors.

There were no noteworthy differences in the ratio of V.D.S. to V.D.G. cases by place of exposure except for exposures in bawdy houses. The S:G ratio for this group was significantly higher than that for other groups.

INTOXICATION AT TIME OF EXPOSURE

Reliable data on the part played by alcohol in facilitation is difficult if not impossible to secure. The R.C.A.F. venereal disease report form merely attempted to ascertain whether the individual was "intoxicated". The facts secured from examination of recorded data are set out in Table VI.

Despite the limitations of reporting, it is striking that in two out of every five cases, "intoxication" at the time of exposure was specified. This finding is valuable in adding fact to impression. There was no significant difference among the several commands in the proportion of individuals reported to have been "intoxicated" at the time of exposure.

TABLE VI.
INTOXICATION AT TIME OF EXPOSURE

Intoxic- ated	Prostitute		Pick-up		Not stated		Total	
	No.	%	No.	%	No.	%	No.	%
Yes.....	75	60.5	605	37.9	9	19.6	689	39.1
No.....	33	26.6	772	48.5	23	50.0	828	46.9
Not stated..	16	12.9	217	13.6	14	30.4	247	14.0
Total..	124	100.0	1,594	100.0	46	100.0	1,764	100.0

It is of interest that intoxication was specified in more than 60.5% of cases in which a prostitute was the alleged contact, compared with only 37.9% in the case of amateurs and 39.1% in all cases.

PROPHYLAXIS

The recorded data on prophylaxis were tabulated with a view to ascertaining the proportion of cases in which a condom was used and the proportion of the infections in which prophylaxis was taken within eight hours of exposure. The findings are given in Table VII.

TABLE VII.
PROPHYLAXIS AND USE OF CONDOMS

Group	Condom used		Condom not used		Not stated	Total	
	No.	%	No.	%		No.	%
Prophylaxis taken.....	161	44.4	485	35.1	11	657	37.2
Prophylaxis not taken...	202	55.6	898	64.9	7	1,107	62.8
Total.....	363	100.0	1,383	100.0	18	1,764	100.0
%.....	20.6	..	78.4	..	1.0	100.0	..

In only 37.2% of all cases was prophylaxis stated to have been taken within eight hours. While this appears to suggest futility of prophylaxis, the facts are that in the great bulk of these cases, prophylaxis was self-administered.

In 363 cases (only 20.6% of all cases) a condom was used. This number includes all cases in which use of a condom was reported and includes many cases in which failure of the condom was reported by the patient, as well as many more in which the condom was improperly or inadequately used.

The fact that a condom was reported to have been used in 363 cases cannot be interpreted, therefore, as a measure of the extent of failure of condoms.

Prophylaxis was taken more frequently by the group in which a condom was used but in only 161 cases, or 9.1% of all cases under review, was a condom used *and* prophylaxis taken. In almost four-fifths of all cases a condom was not used at all. One-half of the cases did not take prophylaxis *or* use a condom.

TYPES OF PROPHYLAXIS AND FAILURES AFTER PROPHYLAXIS

A tabulation of reported types of prophylaxis, in relation to use of condoms, is set out in Table VIII, for the 657 cases reported as having taken prophylaxis.

TABLE VIII.

TYPE OF PROPHYLAXIS AND USE OF CONDOMS

Type of prophylaxis*	Condom	No condom	Not stated	Total
SW.....	110	301	1	412
O.....	19	56	3	78
I.....	0	6	1	7
DW.....	5	10	0	15
SW-O.....	19	52	1	72
SW-I.....	0	5	0	5
SW-DW.....	1	8	0	9
O-I.....	1	4	0	5
O-DW.....	1	4	0	5
SW-O-I.....	0	5	0	5
SW-O-DW.....	2	17	0	19
Others.....	0	7	0	7
Not stated.....	3	10	5	18
Total.....	161	485	11	657

* DW = Disinfectant wash, I = Irrigation, SW = Soap and water, O = Ointment.

These data cannot be interpreted as evidence of the value or otherwise of prophylaxis. They merely are presented as evidence of the types of prophylaxis actually taken by 657 in a group of 1,764 infected cases. In a good many cases the treatments were self-administered and unsupervised and therefore almost certainly improperly carried out.

DISCUSSION

The value of a system of confidential reports on all venereal disease cases, comprising facts concerning the case, the contact and the facilitation process, has been demonstrated by this review. Indeed, the approach to the problem of venereal disease control in the R.C.A.F. during 1944, will be based in large measure upon the facts obtained from this analysis.

There is no doubt that the system can be made more valuable if greater care were taken in the collection of contact information from patients.

The business of interviewing patients requires care, tact and patience. It is likewise important that the data on alleged contacts should be secured at the earliest possible moment. Careful questioning is necessary and it has been represented that a trained N.C.O. might get better results than the medical officer, but this is extremely doubtful. It is considered most important that it should invariably be a medical officer who interviews the individual concerned. This is R.C.A.F. practice. The whole process is a most confidential one and it is most essential that the patient's confidence should be gained at the outset and a close relationship maintained throughout the treatment and observation period.

Difficulties which are met in the follow-up of contacts, one of the principal objectives of venereal disease reports, are acknowledged. Especially is this true of V.D.G. in women. Active venereal disease case-finding programs, on the part of all health departments, would greatly facilitate the control of venereal disease in the nation as a whole and in the armed forces in particular.

On the basis of experience and in the light of this study, a simplified and more accessible confidential venereal disease report form (form R.C.A.F. M.66, Notification, Contact and Facilitation Record) was introduced in February, 1944 (Fig. 1).

This new form omits certain questions formerly asked and only the basic essentials are included. Dependence for data on prophylaxis, the use of alcohol and ancillary problems will rest on special enquiries made from time to time as may be indicated. On the reverse side of this form provision is made for recording transfers of cases from one unit or command to another. The new report form was developed with a view to facilitating studies of recorded data and adaptation to punch card analysis.

SUMMARY

1. The findings in a study of 1,764 confidential venereal disease reports received at Air Force Headquarters during 1943, are presented.
2. The value of special confidential reports on all venereal disease cases and comprising notification of cases, as well as data on alleged contacts and the facilitation process is demonstrated.
3. Weaknesses in completeness of reporting are discussed. In 43.1% of reports, the information given was inadequate for location of the alleged

contact. In 56.9%, the details were probably sufficient for contact investigations.

4. The casual "pick-up" is the leading source of infection, being reported as the alleged contact in over 90% of the cases.

5. The incidence of syphilis was significantly higher in the prostitute group.

6. Control of venereal disease (in the R.C.A.F.) is dependent in a large measure upon the control of clandestine sources of infection.

7. One-third of all alleged contacts were reported to be under 20 years of age.

8. Inter-command and inter-province spread of venereal disease is a serious problem. Sources of infection, in any area, are responsible for dissemination of infection to distant points in the nation.

9. Night clubs, hotels and dance halls, as a group, lead in importance as places of initial encounter between case and contact.

Figure 1

Confidential

**ROYAL CANADIAN AIR FORCE
NOTIFICATION, CONTACT & FACILITATION RECORD
(Venereal Disease)**

DISEASE: V.D.S. V.D.G. Chancreoid... N.S.U. (Ven.)
SERVICE: R.C.A.F. R.A.F. R.A.A.F. R.N.Z.A.F.

Reporting Unit.....
Command.....

THE CASE

1. Number.....	Rank.....	Name.....	Age.....
2. Trade or category.....		Marital status.....	Religion.....
3. Date of enlistment.....		Date of first symptom.....	Date reported to M.O.....
4. Date of suspected exposure.....		Parent unit at time of exposure.....	Condom worn?.....
5. Exposure occurred while on: Annual leave..... Emb. leave.....		48 hr. pass..... Late pass.....	Other.....
6. Diagnosis (official nomenclature).....			Date.....
7. Diagnosis confirmed by: Smear..... Culture..... Dark field..... Blood test..... Spinal fluid.....			
8. Any previous treatment before diagnosis?.....		Type of treatment.....	
9. By whom given (civilian doctor, self, druggist, other, specify).....			

THE ALLEGED CONTACT (If more than one contact, prepare separate sheets for each)

10. Name (record also pet-names and aliases).....	Relationship, if any.....
11. Address.....	
12. Places usually seen or commonly frequented.....	
13. Age..... Marital status.....	Height: short..... medium..... tall.....
14. Colour of eyes..... Hair.....	Build: slight..... medium..... heavy.....
15. Other descriptive facts.....	
16. Occupation.....	Where employed.....

FACILITATION PROCESS

17. Where was contact met (street, canteen, beer parlour, dance hall, bawdy house, etc.—give details). (Specify address, if possible).....	
18. How did patient meet contact.....	
19. Time met (date and hour).....	Time of exposure (date and hour).....
20. Where exposure occurred (hotel, rooming house, private house, cabin, car, outdoors).....	
21. Address of above.....	
22. Was a charge made.....	Amount.....
23. Payment made to any other person (room rental, hotel clerk, etc.).....	
24. Further information re this exposure.....	

Date..... Unit..... Signature of M.O.....

FOLLOW-UP ACTION REPORT

HEALTH DEPARTMENT FOLLOW-UP OF ALLEGED CONTACT

1. Found infected: V.D.S. V.D.G.
2. Examined and found negative.....
3. Not located or examined.....
4. No follow-up possible.....

INVESTIGATION RE FACILITATION

1. Information sent to.....
2. Action taken.....

INSTRUCTIONS: 1. Complete this form in quadruplicate.

2. One copy is to be retained by the unit, and three sent to C.H.Q. (P.M.O.)
3. C.H.Q. is to retain one copy, and send one to A.F.H.Q. (D.M.S. (Air)), and pass one copy to the Provincial Health Department (Venereal Disease Control).
4. All copies are to be countersigned by the medical officer.

10. Hotels were the reported place of exposure in 35.9% of cases. One-third of exposures occurred in private houses, apartments or rooming houses.

11. In 39.1% of cases "intoxication" was reported at the time of exposure. In the prostitute group the percentage was 60.5%.

12. Prophylaxis was reported to have been taken within eight hours in 37.2% of cases. In the great bulk of these cases prophylaxis was self-administered and almost certainly improperly carried out.

13. In two-thirds of all cases no prophylaxis of any type was attempted or taken.

14. Attention is directed to the importance of well-organized follow-up of alleged contacts by civilian health departments, in the interests of national venereal disease control.

15. The approach to the problem of venereal disease control in the R.C.A.F. during 1944 will be based in large measure on the facts obtained from this analysis.

16. A new venereal disease report form has been developed, comprising notification of cases and facts concerning alleged contacts and the facilitation process.

REFERENCES

1. NORRIS, E. W., DOYLE, A. F. AND ISKRANT, A. P.: *Am. J. Pub. Health*, 1943, 33: 1069.
2. Incidence of venereal disease, Editorial, *Brit. M. J.*, 1941, 2: 208.
3. GIBSON, N. M.: *M. J. Australia*, 1942, 2: 290.
4. Gulf Coast Army Air Force Training Centre, Randolph Field, Texas, Ven. Dis. Bull. No. 2, 1942 (Sept. 26).

ULTRAVIOLET RADIATION IN SURGERY

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RESEARCHES on the effects of ultraviolet radiation on organisms have already provided an extensive literature of great importance to medicine, surgery, bacteriology, and public health. The clinical literature, however, is relatively small, and very few surgeons have contributed to it. In the United States the largest number of clinical papers have come from Hart,¹ Meleney,² Kraissl,² and their associates. In Canada, valuable studies have been reported by Robertson³ and Watson.⁴

With the exception of the above-named authors, ultraviolet radiation in surgery has

not received the full clinical and experimental study which it deserves if its value is to be appraised correctly. There should be the closest co-operation between surgeons and laboratory investigators. Experimental studies should be organized with operating room conditions and procedures in mind, and surgeons should accept or reject the use of ultraviolet on a scientific basis rather than on personal preferences or dislikes for the techniques involved.

Extensive clinical reports on thousands of operations performed under ultraviolet radiation show important reductions in the number of wound contaminations and postoperative infections, but there has also been demonstrated experimentally the possibility of varying degrees of inflammatory reaction, postoperative adhesions, and even gangrene if the intensity and duration of radiation are not kept within certain limits. No cases of such undesirable results in human surgery have been reported, although radiation has been used in a wide variety of operations, particularly in those involving extensive operative fields, such as thoracoplasties, mastectomies, and orthopaedic operations.

Other reports cover herniorraphies, thyroidectomies, urologic operations, various laparotomies, plastic operations, and some neurosurgery. Hart reports very striking reductions in the percentage of infected wounds in several thousand operations under radiation (in one series of over 800 operations a reduction of over 85%) and states that even where in some cases the optimum intensity in microwatts per square centimetre had been doubled he had never seen the slightest evidence of damage to the patient in any way. On the contrary, he reports lowered postoperative temperatures, improvement in wound healing, lessened systemic reaction, and shortened convalescence. Watson found infections to be greatly reduced and noted better healing and less temperature and pain than one would expect. Robertson did not observe any change in the rate of healing of operative wounds in children, nor were postoperative temperatures in irradiated cases appreciably lower than the controls, but in many cases antitoxin injections shortly after operation made it difficult to interpret their temperature reactions.

Kraissl, Cimiotti, and Meleney point out that "it is self-evident that a wound which received no bacterial contamination may logically be expected to heal more quickly and with less reaction than a contaminated wound even though it did not suppurate, and any lessening of contamination will have a proportionately favourable effect". Some observers have felt that "radiation has a beneficial effect on the wound itself". One observer (Pollaczek) reported definitely beneficial effects of a small amount of radiation, but that a larger amount retarded wound healing. It should be emphasized, however, that his radiation included infra-red and visible wavelengths, whereas the radiation used in all other investigations cited herein was limited to the optimum bactericidal field of practically monochromatic wavelength 2537 Å.

The purpose of this paper is to present certain points of practical import, including the results of experimental operations under ultraviolet radiation as carried on in our own laboratory, in the hope that it may help to interest surgeons and bacteriologists in wider studies and more critical appraisals of ultraviolet radiation in the operating room. Any promising physical or chemical method of preventing operative wound contamination by pathogenic bacteria deserves the fullest study, both clinical and experimental, for we have not yet reached such a state of perfection in surgical bacteriology that post-operative infections are of negligible frequency.

RADIATION EFFICIENCY STUDIES

Before experimental operations on laboratory animals were commenced in our laboratory, studies were made over a period of several months to test the bactericidal efficiency of the same Westinghouse sterilamp which we were to use for radiation of animal tissue later. This was done by radiation of blood agar plates seeded with various test organisms, sometimes with several strains of each organism.

Radiation unit.—It was felt that aside from the usual measure of intensity (microwatts per square centimetre) it was desirable to test the bactericidal power of a single radiation unit, and the following experiments were carried on with a single 30-inch sterilamp tube which the Westinghouse Company had checked carefully at the factory to insure correct output.

Distances and times.—In one series, radiations were made at distances of 10, 20, 30, 40, 50, and 60 inches. At each distance six plates were exposed, 2 for 5 minutes, 2 for 10 minutes, and 2 for 15 minutes. Control plates were seeded and incubated without radiation. In another series all radiations were made at 50 inches. Plates were exposed at 10 minute intervals, from 10 to 90 minutes.

Organisms.—Seven strains of *Staph. aureus* freshly isolated from active infections, two strains of virulent Group A *H. strep.*, and one strain of *Esch. coli* were studied.

Due to space limitations no detailed or tabular report of the results of the foregoing experiments will be made, but the following summary is necessary:

1. Three factors of practical importance are: (a) distance from the ultraviolet source to the organism; (b) duration of radiation; and (c)

the susceptibility or resistance of different organisms, and of different strains of the same organism, particularly in the case of *Staph. aureus* which showed marked differences in susceptibility to radiation. Nothing concerning bactericidal effects was revealed by these experiments that had not already been established by Rentschler⁵ *et al.*, who showed, among other things, that (a) "different strains of the same species are materially different in their resistance to radiation", (b) "the lethal dose for a bacterium is markedly different at different stages of its life cycle", and (c) "a sublethal dose of ultraviolet radiation on bacteria and moulds has a retarding effect on the rate of growth". These points affect experimental results and should be kept in mind in further studies. Our observations were in agreement with them. It is possible that the retarding effect mentioned might be a factor of clinical importance, for obvious reasons.

2. In radiating blood agar plates seeded with seven strains of *Staph. aureus*, at a distance of 50 inches, 98% of the organisms of Strain A were killed by 10 minutes' radiation; 98% of Strains B, C, D, E, and F were killed at 50 inches by 20 minutes' radiation; Strain G was markedly resistant, and 20% of it survived even after 50 minutes' radiation.

At 30 inches, 98% of all seven strains were killed by 5 minutes' radiation.

At 20 inches, 99% or more of all seven strains were killed by from 2 to 3 minutes' radiation.

The two strains of Group I haemolytic streptococci were less resistant than the staphylococci. The one strain of *Esch. coli* used was more resistant than the staphylococci or streptococci, requiring 5 minutes' radiation more than the *Staph. aureus* strains, except Strain G.

Our chief objective, however, was to make a thorough performance test of the same radiation unit that was to be used in experiments on animals to correlate (as did Kraissl *et al.*) the radiation intensities used on seeded plates with post-radiation physiological and histological changes produced in animal tissues, particularly in visceral tissue. This was accomplished.

RADIATION OF VISCERAL TISSUE

The object of our experiments on visceral tissue was to see if any undesirable effects resulted from the degrees of radiation which were found to be the lethal points for the organisms tested.

The experiments of Meleney and his associates deserve special study. He first determined the amount of radiation which would produce adhesions in a loop of guinea-pig intestine. Nembutal anaesthesia was used, and about 8 cm. of intestine was exposed to radiation, during which period it was kept moist with saline. Incisions were closed with three silk sutures through the whole wall and a dressing of collodion applied. The animals were sacrificed after one week and the viscera examined. "The criterion of adhesion formation was the agglutination of loops of the exposed intestine". There were other effects reported. Two hours after radiation at an intensity of 33 clicks (a click is given on their comparative graph as being equal to 1.71 microwatts per square centimetre at 1 metre) per minute for 15 minutes, sections showed a red and white cell extravasation just beneath the delicate serosal layer with slightly enlarged vessels and oedema developing in the walls. In 24 hours after radiation, oedema and blebs were more evident as well as a tremendous dilation of the vessels surrounded by an oedematous mesentery. A more advanced reaction was seen after three days in which there was also evidence of degeneration of the glandular elements. At the end of a week, a section taken through an area of adhesion showed extensive glandular destruction.

To determine the toleration of the viscera for radiation of different intensities and for varying periods of exposure, 56 animals were radiated, and 37 others were subjected to the same operative procedure but were not radiated, and these controls were exposed to air only for varying periods up to one hour. Of 24 controls exposed only to air for 30 minutes, one developed adhesions. Of 11 controls exposed to air for one hour, 5 developed adhesions.

By plotting a comparative graph showing intensity required to sterilize organisms on seeded plates and that required to produce adhesions in guinea-pig viscera, a safety line was established as a guide to tolerances.

In our own experiments, we did not attempt to duplicate their results by using the same intensities. Instead, we used the same general range of times and distances within which lay the lethal dosages of our radiation unit for the organisms tested. We did not use the same operative technique, but began with a preoperative injection of morphine, followed by ether.

The same size of intestinal loop (about 8 cm.) was used in guinea-pigs, but larger loops (up to 20 cm.) were used in rabbits. In most cases various levels of the small intestine were selected, including a few at the pyloric end and a few at the ileo-colic junction. In three cases 10 to 15 cm. of the colon was exposed. The intestine was touched only with rubber-sheathed Koehler intestinal forceps and brought out and returned with extreme delicacy. It rested on a pad of several thicknesses of smooth bandage gauze, and both it and the gauze were kept constantly moist with saline kept at body temperature. In the case of the controls which were not radiated, it was protected by a sterile canopy to minimize the chance of air-borne organisms contaminating it. No risk of peritoneal irritation or adhesions through tale was permitted, and in the later operations potassium bitartrate was used, as it does not cause adhesions. Great care was taken to prevent even the smallest amount of blood from gaining entrance. The operations were almost bloodless, and only in one case did three or four drops enter the cavity. The most rigid asepsis was observed throughout every stage of the operations. Sterile rubber gloves, masks, caps, and gowns were worn, and special care was given to instruments and sutures.

Suturing was done in two layers, the deep layer with silk and the skin with fine stainless steel wire. In a few cases linen or cotton sutures were used, but silk and steel were found more suitable. Wire skin sutures are of value in preventing animals from pulling out stitches, thereby resulting in infections or death. All sutures were interrupted. Care was taken to avoid too much tension. Alphamel ointment or metaphen ointment was applied freely to the incision at the conclusion of the operation.

Our only adverse criticism of Kraissl's method is that he sutured through the whole wall with silk. Through-and-through sutures in experimental surgery can become contaminated and provide a very direct pathway for peritoneal infection, which could result in inflammation and adhesions. Moreover, animals pulling and worrying at through-and-through sutures could cause considerable peritoneal injury and inflammation. Where, as in these experiments, adhesion production has been made the chief criterion of radiation injury, it would seem desirable to avoid completely any possibility of producing adhesions which might be improperly attributed to radiation. The graph of Kraissl's

results, however, does not indicate any errors due to these possibilities.

Radiations.—We shall report our radiations and results in the simplest form possible. In the present status of ultraviolet radiation in surgery, very few surgeons are interested in the complex technicalities of electricity and physics

TABLE I.
EFFECTS OF RADIATION ON VISCERAL TISSUES

Animal No.	Distance in ins.	Duration in mins.	Results
G 1	5	10	No adhesions or other adverse effects
G 2	10	10	" " " "
G 3	10	10	" " " "
G 4	10	10	" " " "
G 5	10	10	" " " "
G 6	10	10	" " " "
G 7	10	10	" " " "
G 8	10	10	" " " "
G 9	10	10	" " " "
G10	10	10	" " " "
G11	10	10	" " " "
G12	10	10	" " " "
G13	10	10	" " " "
G14	10	10	" " " "
G15	10	15	" " " "
R16	10	15	" " " "
G17	10	30	" " " "
G18	10	30	" " " "
G19	10	30	" " " "
R20	10	30	" " " "
R21	10	30	" " " "
R22	10	30	" " " "
G23	20	10	" " " "
G24	20	10	Adhesions of omentum; no agglutination of intestine.
R25	20	30	No adhesions or other adverse effects
R26	20	45	" " " "
R27	20	45	" " " "
R28	20	45	" " " "
R29	20	45	One typical agglutinative adhesion of small intestine.
R30	20	60	No adhesions or other adverse effects
R31	20	60	Adhesion of colon to incision.
R32	20	60	Animal died 20 mins. after operation

CONTROLS

NO RADIATION. TISSUES EXPOSED TO AIR ONLY

G33	..	..	G33 to G40 inclusive had intestine brought out, placed on saline-moistened pad, and then returned at once without further exposure to air. No adhesions or other adverse effects.
G41	..	10	No adhesions or other adverse effects
G42	..	10	" " " "
G43	..	10	" " " "
G44	..	10	" " " "
G45	..	15	" " " "
R46	..	15	" " " "
R47	..	30	" " " "
R48	..	60	" " " "
R49	..	60	" " " "
R50	..	60	" " " "

In the above table, G = guinea-pig and R = rabbit.

concerned. The average surgeon has little time for studying radiant energy, being quite willing to leave to the research men such things as generator types, spectrographs, milliwatts, microwatts, ergs, tantalum photocell radiometers, etc., all of which have been dealt with adequately in a very extensive literature and by highly qualified investigators. He asks three questions: (1) Is such radiation powerful and efficient in its germicidal action? (2) Is there any possibility of it injuring tissues or producing undesirable physiological effects? (3) Does it fit smoothly into the equipment and procedures of the operating room, or is it awkward or inconvenient?

Our results, and those of other investigators, make some contribution toward answering the first two of these questions.

MICROSCOPIC EXAMINATION

Several hundred sections from radiated tissues and from controls were cut, stained, and examined. Both paraffin and frozen sections were used, and were stained with haematoxylin and eosin, Van Gieson's picro-fuchsin, or polychrome methylene blue.

The intensities we used produced almost none of the injurious effects which Kraissl demonstrated as the results of excessive radiation. We found no oedema, no subserosal blebs, and no leukocytic or red cell extravasations.

In our one case (R29) of typical agglutinative loop-adhesions, there was a moderate degree of glandular degeneration of the mucosa.

In R31, where the colon adhered to the incision, there was no injury to the mucosa.

In R50, the unexplained fatality, there was no injury observable.

DISCUSSION OF EXPERIMENTAL RESULTS

1. While no sweeping conclusions can be drawn from this or any other similar series, all the experimental evidence gives convincing proof of the bactericidal power of such radiation.

2. The amounts of radiation used on the visceral tissues were greater than those found necessary to reach lethal points in the plate radiations. Among 20 guinea-pigs radiated at from 20 inches for 10 minutes up to 10 inches for 30 minutes (or even higher) no adhesions of the agglutinative type described by Kraissl resulted. In about two-thirds of all animals, including the non-radiated controls, the omentum adhered to the incision, and in two cases

extended somewhat further, but the controls show that this could not be attributed to radiation. The longer periods of radiation—which, it must be repeated, were excessive both as to distance and duration—produced among the seven rabbits so radiated two cases of adhesions. There was also one fatal result which we were unable to explain. In 8 of the 18 non-radiated controls, the loop of intestine was returned at once. In 10 others, it was exposed only to air (being kept moist constantly with saline) for from 10 to 60 minutes. Three rabbits so exposed for 60 minutes showed no adhesions or any other ill effects. Kraissl found that after one hour, 5 out of 11 control animals developed adhesions from air exposure alone.

AEROBIOLOGY

In the light of recent aerobiological investigations conducted by surgeons, physicians, bacteriologists, pathologists, and electrical research workers, the immense importance of air-borne micro-organisms can no longer be ignored. Any one who still thinks this a negligible factor can not have studied the volume of findings of the Symposium on Aerobiology of the American Association for the Advancement of Science at its September, 1942, meeting at Chicago, nor have read such papers as that of Professor O. H. Robertson¹¹ of the Department of Medicine of the University of Chicago on "Air-borne infection". Neither can the place of ultraviolet radiation, as shown not only at that meeting but in a large and expanding literature from authoritative sources, be ignored.

It is for the surgeon to decide whether or not he wishes to use ultraviolet radiation in his operating room. Our answer to his third question is that it need cause no great inconvenience or discomfort to the operating staff, and it is not incompatible with the numerous types of operative procedures mentioned before. If an overhead installation immediately above the operating-table is preferred, then the eyes must be protected by glasses and visors, and in some cases the skin may need protection. It is this type of installation, however, to which some surgeons object. A more desirable method would be to confine radiation to the upper air of the operating room, using indirect fixtures, or to have the air circulate through ducts containing ultraviolet generators. Neither of these can cause the staff any discomfort, and should result

in the destruction of a high percentage of air-borne micro-organisms.

But the air immediately above the operative field is the most important area of all. It has the highest bacterial content, and the organisms present come chiefly from the operating staff. This has been demonstrated beyond doubt. The type of surgical mask still commonly in use has been shown to be deficient in preventing the giving off of bacteria from the nose and mouth of the surgeon. The surgeon who even leaves his nose uncovered by the mask is not yet extinct, nor is the surgeon who talks too much, and close to the wound at that.

Deryl Hart says "Pathogenic bacteria given off from the noses and throats of the occupants of the modern well-run operating room, floating in the air and sedimenting on the sterile field, comprise the greatest breach in our present day aseptic technique and present the greatest hazard of infection in large operative wounds".

LOCAL OR "SPOT" RADIATION

Our selection of short distances, ten or twenty inches from the generator, was determined by the possible desirability of combining general radiation of operating room air (by the indirect stratum or duct methods) with local or "spot" radiation of the operative field.

So far as the writer can determine, Major C. H. Watson, R.C.A.M.C., was the first surgeon to use local radiation, having in 1936 combined a grill of eight ten-inch Westinghouse sterilamp tubes with an operay spot-type operating light, with excellent results. A metal cone protected the operator's eyes and limited the radiation to the operative field. At least one electrical company now manufactures a small portable ultraviolet generator for spot radiation at short distances.

Intensity limitations.—The Council on Physical Therapy of the American Medical Association has laid down certain limitations of intensity as follows: a limit of 5 microwatts per square centimetre for one hour exposure, 10 m-w per sq. cm. for 30 minutes, or 30 m-w per sq. cm. for 10 minutes. These lie well inside the safety zone.

Kraissl says that the optimum intensity is that needed to kill 99.5% of organisms suspended in air for one minute, (which, he states, is about the time an organism will take to drop a distance of three feet in still air). "At this same intensity", he says "our experimental

animal studies have shown that guinea-pig viscera, which is probably more sensitive than human viscera, will not show changes after 40 minutes' exposure. This would probably exceed the actual time of continuous exposure of any one portion of a patient's viscera during any type of operation."

Deryl Hart says "We have since used radiation intensities on the operative wound varying from 18 to 32 microwatts per sq. cm. in over 3,000 cases and have never seen the slightest evidence of damage to the patient in any way". In his conclusion he states that by the use of proper intensities "over a period of 5 years and 8 months, we have secured improved wound healing, eliminated deaths from unexplained infections to from 1/20 to 1/100 of the previous level, and secured a most gratifying reduction in both the elevation of temperature and duration of this elevated temperature in patients following operation."

It should be pointed out that Hart also stresses the need for a full program of other precautionary measures against surgical infections.

This brings us to a point that requires the utmost emphasis and continued reiteration, namely that ultraviolet radiation, air-conditioning filtration, aerosol spraying, and any or all treatments of operating room air can not replace a better degree of personal aseptic precautions by the operating room staff and particularly by the surgeon himself. Surgeons vary considerably in this respect. Some are admirably painstaking and others are less careful. Some are glad to have the co-operation of the bacteriologist in reducing the menace of infections, and it must be remembered that it has been surgeons who have contributed all the clinical and much of the experimental work on which the practical use of ultraviolet in surgery is founded. There are other surgeons, however, who do not welcome what they call "well-meaning but impracticable suggestions of bacteriologists who do not have to accept the compulsions and compromises which beset surgeons, and which make aseptic procedures relative rather than absolute". We feel that such an attitude must give way before the advance of our knowledge of air-borne infections and of improved methods of preventing them. The operating room is only one factor in a complex equation of preoperative, operative, and post-operative care. Lack of adequate precautions

in the ward may undo all the protective efforts of the operating room.

There is a certain psychological danger that too much dependence upon ultraviolet radiation may result in neglect of many other important and indispensable safeguards. For example, the investigations and recommendations of Hare and Willits^{8, 9, 10} are, in our opinion, of far greater importance than any such single factor as ultraviolet radiation. They are based on sound experimental and clinical evidence, and the essential principles which underlie the preventive measures recommended are beyond argument. If ward infections are to be reduced or eliminated, there must be universal acceptance and practice of the precautionary measures connected with masking, dressing technique, cleaning, bed-making, and, above all, of wing segregation of infected cases. As a bacteriologist, I can see no other choice.

Hare points out that "no one measure will suddenly prevent sepsis in any wounds. The whole technique of wound treatment from the moment the wound is inflicted until it is finally healed should be such as to minimize as far as possible the danger of ingress of potentially pathogenic organisms."

In this progression, involving many measures, the use of ultraviolet radiation has not yet been subjected to proper evaluation. Its germicidal value is indubitable, and there has been sufficient clinical trial and experimental study to provide a firm foundation for more extensive study and use. So far as we have been able to secure information, there are only five hospitals in Canada in which ultraviolet radiation is used in the operating room, and in at least three of them the use is occasional rather than routine. The results already achieved by its use in the United States demand wider and more critical studies than have been given to it. We may be neglecting a very valuable weapon in our armamentarium, and if this paper serves to stimulate wider interest among surgeons and bacteriologists, it will have served one of its purposes.

FURTHER STUDIES

Through the co-operation of the Canadian Westinghouse Company and the Burke Electric and X-Ray Company, a concentrated or "spot" radiation assembly of eight 10-inch sterilamp tubes duplicating the ultraviolet component used by Watson has been made available to our laboratory. Further studies will be made of

the effects of radiation on visceral tissues, on brain and nerves, on some of the tissues involved in orthopaedic surgery, and on the comparative resistance of some strains of the pyogenic cocci to ultraviolet radiation.

SUMMARY

1. The present status of ultraviolet radiation in surgery, both clinically and experimentally, has been outlined.
2. Experimental evidence of the effects of such radiation on seeded plates and on visceral tissues has been presented.
3. Emphasis is laid on the need for a full program of preventive measures, particularly with regard to ward infections, rather than too great dependence on any one of such measures.
4. In view of our increased understanding of air-borne infection it is felt that we may be neglecting to utilize a valuable method of safeguarding operative wounds from micro-organisms in the air of the operating room. Aside from outright infection, the prevention of wound *contamination* is important.
5. The results already obtained both in clinical and laboratory investigations make further studies desirable.

We are greatly indebted to Major C. H. Watson, R.C.A.M.C., for his most helpful and unselfish co-operation; to Dr. Roscoe R. Graham of the Canadian Society of Clinical Surgeons for permission to use Major Watson's paper as presented before that Society; to Dr. Frank L. Meleney of New York and Dr. Deryl Hart of Duke University for a great deal of valuable information; to the Canadian Westinghouse Company and the Burke Electric and X-Ray Company for their generous donations of material difficult to secure in war-time and for skilled craftsmanship still harder to spare; to the Canadian General Electric Company for technical literature; to the hospitals which gave information or made possible observation on their ultraviolet equipment; to a number of surgeons and bacteriologists who made helpful suggestions; to Dr. George J. Trueman for making these studies possible; to JoAnne Innes Bell, David Bishop, and Joan Spaulding for much experimental work; and to my wife for technical assistance.

REFERENCES

1. HART, D.: *Aerobiology*, 1942, 17: 186.
2. KRAISL, CIMIOTTI AND MELENEY: *Ann. Surg.*, 1940, 3: 161.
3. ROBERTSON, E. C. AND DOYLE, M. E.: *Ann. Surg.*, 1940, 3: 491.
4. WATSON, C. H.: Paper presented before the Canadian Society of Clinical Surgeons, 1936.
5. RENTSCHLER, H. C., NAGY, R. AND MOUROMSEFF, G.: *J. Bact.*, 1941, 41: 745.
6. *Idem*: *Aerobiology*, 1942, 17: 166.
7. HART, D.: *Surg. Clin. North Am.*, 1942, 22: 357.
8. HARE, R. AND WILLITS, R. E.: *Canad. M. Ass. J.*, 1941, 44: 230.
9. WILLITS, R. E. AND HARE, R.: *Canad. M. Ass. J.*, 1941, 45: 479.
10. HARE, R. AND WILLITS, R. E.: *Canad. M. Ass. J.*, 1942, 46: 23.
11. ROBERTSON, O. H.: *Science*, 1943, 97: 495.

ANÆSTHESIA AS PRACTISED ON ACTIVE SERVICE IN THE NAVY

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THE practice of anaesthesia in our naval base hospitals does not differ markedly from that in civilian institutions so far as agents and techniques used are concerned. The majority of our patients are, however, healthy young adults who have entered the service in perfect health. Their age groups vary between twenty and thirty years. Many others in the meantime become medically unfit either due to the wear and tear of service life or enemy action. Recruits coming from warm dry climates to the damp coastal areas, or going aboard ship exposed to all types of weather, develop upper respiratory infections, rheumatic fever and so on. Needless to say a large percentage of our emergency cases have, on entering hospital, upper respiratory infections.

Dr. Wesley Bourne has said "Although men of the fighting services are of necessity exceptionally fit before an engagement, they may frequently be most urgently in need of the best attention known to anaesthesia after the conflict." This was brought to our attention many times in the Navy when submarine warfare was at its height. Survivors were brought into our hospitals suffering from burns, exposure, dehydration and injuries from torpedo and depth charge blasts. Many were in critical condition and needed the utmost in medical, surgical and anaesthetic management. After being in hospital a few days many lost their nerve, could not sleep and dreaded any proposed operative procedure. Large doses of sedatives had very little effect except to depress or excite them. Cyclopropane and intravenous pentothal sodium were anaesthetic agents used with gratifying results to all concerned. Due to the nervous state of these patients local and spinal anaesthesia were contraindicated.

Generally speaking, heavier premedication is required than for people in civilian life. Nembutal gr. 1½ at night and two hours preoperatively plus morphine gr. 1/6 and hyoscine gr. 1/100 has not much more effect than to put the patient in a pleasant frame of mind. If

* Read at the Seventy-fifth Annual Meeting of the Canadian Medical Association, Section of Anaesthesia, Toronto, May 25, 1944.

the patient is still apprehensive on arriving in the operating theatre more sedation is usually given intravenously to get the desired effect.

During the past year and a half 2,117 anaesthetics have been administered by the Department of Anæsthesia at the Royal Canadian Naval Hospital at Halifax.

Spinal	49.8%
Intravenous pentothal sodium.....	31.9%
Inhalation	13.0%
Local and regional.....	5.2%

There were also 938 local anaesthetics administered by the surgeons.

Spinal anaesthesia was used in all intra-abdominal surgery unless contraindicated. The excellent relaxation obtained, the ease of administration and the comparative well-being of our patients during the postoperative period places spinal anaesthesia high in the list as an ideal anaesthetic for abdominal surgery in naval personnel. Our patients tolerate this procedure well and often request this form of anaesthesia. Spinal anaesthesia is also used for herniotomies, genito-urinary operations and lower extremity work.

Nupercaine 1-1,500 dilution, pontocaine hydrochloride and procaine crystals were the drugs employed. We found that pontocaine mixed with equal parts of 10% glucose saline was the best agent for use in operations lasting from one hour to two hours. Nupercaine was used for longer cases such as cholecystectomies and gastric resections. Procaine was used for shorter operations as in rectal surgery, for circumcisions and lower extremity work. Recently we have acquired a continuous spinal outfit which we use for longer abdominal procedures.

Regardless of the drug used, it was found in certain cases that manipulation of the bowel or pulling on the mesentery caused pain, nausea or vomiting, even though the anaesthetic level was as high as the fourth dorsal vertebra. However, it was noted that in the majority of these patients premedication was inadequate and most of them were somewhat apprehensive. Relief quickly followed either the intravenous injection of two or three cubic centimetres of pentothal sodium, morphine, a few minutes of cyclopropane or analgesic doses of nitrous oxide and oxygen. All patients having high spinal anaesthesia were given oxygen into the pharynx by nasal catheter.

Headaches occurred in 4.35% of spinal anaesthetics and were, as a rule, of the mild variety

lasting two to twelve hours and controlled by raising the foot of the bed and giving aspirin by mouth. Many persisted for two to five days in spite of the usual treatment. The foot of the bed was not raised routinely in this series except in those who developed headaches.

About 80% of headaches which occurred were after low spinal anaesthetics, as for circumcisions, haemorrhoidectomies and cystoscopies. While the majority of these patients were given procaine it does not mean that the headaches were due to the above drug but rather to the fact that these patients were apt to move around early after operation as they felt so well. The patient with an abdominal incision is more likely to keep quiet and behave himself.

One case of aseptic or chemical meningitis occurred after a low procaine spinal for haemorrhoidectomy and recovered without any residual effects. Another patient collapsed after 100 milligrams of procaine for a circumcision. After adequate intravenous therapy and resuscitation his blood pressure, pulse and breathing returned to normal in about ten minutes.

An interesting point one found in these husky young men was the infrequent need for vasoconstrictor drugs. If they were used it was usually after procaine or a high spinal anaesthesia. Ephedrine proved satisfactory in all cases and was usually given intravenously when necessary.

Total respiratory complications occurring after intra-abdominal and abdominal wall operations were 9.8%, which is quite high. Atelectasis and pneumonia occurred in 4.24% of cases, 60% of which had severe upper respiratory infections prior to the operation. These cases of atelectasis were of the mild variety and responded readily to vigorous coughing, deep breathing, oxygen and frequent changes of position. Pneumonia developed after a gastric resection and after a perforated duodenal ulcer.

No comparison has been made between spinal and inhalation anaesthesia, as most of the abdominal and abdominal wall surgery was done under spinal anaesthesia.

Pentothal sodium intravenously has become one of our most useful and safe anaesthetic agents. The advantages listed by Lieutenant-Commander Wade, U.S.N., are: the ease of administration, rapidity of induction and recovery with a high degree of safety, freedom from danger of explosion and the minimum amount of equipment required.

Colonel E. B. Leech, R.C.A.M.C., reports that after the Dieppe raid: 51.2% of all casualties were given pentothal sodium intravenously; 3.5% were given pentothal sodium with nitrous oxide, and oxygen, or cyclopropane.

In our series of 700 administrations there was one case of severe laryngospasm in a thick-necked individual who did not have any atropine preoperatively. Another case required controlled breathing and coramine for about four minutes due to an overdose. Metrazol and picrotoxin were not needed in this series. The absence of nausea and vomiting was most striking and only occurred a few times in patients who had had a recent meal. Nembutal grains 1½ the night before and two hours preoperatively plus morphine gr. 1/6 or 1/4, and atropine 1/100 was the average premedication used.

Pentothal sodium was used in 2½ to 5% solutions and given by intermittent injection for reduction of fractures, incision and drainage of abscesses, tendon suturing, amputation of fingers and toes, lacerations, circumcisions, cystoscopies, dilatation and curettage, extraction of teeth, for induction of anaesthesia to supplement spinal anaesthesia and for use in the x-ray room.

The longest administration was 2½ hours and the majority of longer cases were supplemented with 50% nitrous oxide and oxygen in order to cut down on the amount of pentothal used, to secure better relaxation and quicker recovery.

One is impressed by the number of ratings returning from overseas who request pentothal sodium anaesthesia.

During a nine-month period in 1943, cyclopropane was administered in 40.28% of all inhalation anaesthetics; cyclopropane and ether in 29.17%; nitrous oxide, oxygen, and ether in 30.55%. Endotracheal anaesthesia was used in 41.66% of cases. I consider cyclopropane as one of our best choices as an anaesthetic agent in shock or potential shock cases. In many instances after severe haemorrhage patients seemed to improve immediately after anaesthesia was established. The blood pressure increased, pulse became slower, the colour improved and the general condition of the patient seemed better. Colonel Leech advocates cyclopropane in surgery of the head and neck, chest and abdomen when dealing with patients in shock.

Ether was added when adequate relaxation of the abdominal muscles could not be accomplished by cyclopropane alone. A switch to ether was made when cardiac irregularities

occurred and did not disappear on lightening the anaesthesia. Ether was also used in operations of the ear, nose and throat.

The low instance of severe nausea and vomiting in our patients was surprising although most of them felt nauseated and vomited once or twice after ether. The recovery after ether from the point of view of well-being did not compare with that after cyclopropane or intravenous pentothal sodium. Frequent use of the intratracheal catheter both orally and nasally for head, neck, chest and abdominal cases facilitated the anaesthesia for the surgeon, patient and anaesthetist.

Gas machine equipment consists of three Heidbrink portable gas machines of the circle absorber type. No woollen blankets, or cautery, were allowed in the operating theatre, suction machines were grounded and the Horton intercoupler used, as precautions against the explosive hazard.

Local and regional nerve blocks comprised 5.23% of all cases. Brachial, median and ulnar blocks, caudal block combined with second sacral block for rectal surgery, and block for fingers and toes and local field blocks were the ones most frequently used. For rectal surgery a small dose of procaine intraspinally saves a lot of time when one is busy, as caudal block even with 2% procaine often takes twenty to twenty-five minutes to appear in young robust men.

We were somewhat disappointed with the number of requests for diagnostic and therapeutic nerve blocks. Quite a number were performed for sciatica and pains in the back. For sciatica we combined the sciatic block with injection of saline in the caudal canal. Injections for bursitis and a few lumbar sympathetic injections for vascular disease of the lower extremity yielded good results.

Oxygen therapy, resuscitation and intravenous therapy is supervised and controlled by the Department of Anaesthesia. All patients who have had inhalation, intravenous or spinal anaesthetic are taken to a recovery room where they are carefully watched until completely recovered from the anaesthetic. They are then transferred to their respective wards. This room is under the supervision of the anaesthetists and two nursing sisters who are keenly interested in this type of work. It is well equipped for oxygen therapy and resuscitation, intravenous therapy and general treatment. We feel that

this is an additional step towards better anaesthesia.

Anaesthesia aboard ship is usually confined to emergency procedures such as fractures, lacerations, incision and drainage of abscess, burns, and the occasional abdominal emergency. Our ships are liberally supplied with pentothal sodium procaine for local use, procaine crystals for spinals, chloroform and ether. Plasma and glucose saline for intravenous use are at hand at all times. The anaesthetic agent of choice must depend on the ability of the medical officer and the type of injury. It has been my experience that the majority of medical officers, and particularly those who have graduated in the last three years, have had little or no training in anaesthesia. They feel very awkward when the choice of an anaesthetic must be considered along with surgery. Cramped quarters, shortage of trained personnel, rough seas, seasickness, and the fear of fire and explosion have to be considered when giving anaesthetics at sea.

Local anaesthesia is obviously the first choice, and to the best of my knowledge the majority of medical officers at sea use local whenever feasible. Pentothal sodium intravenously and spinal or combinations of both seem to be the next choice whenever possible. Many use ether at sea because they are more familiar with this agent than any other. Chloroform still has its advocates and to my mind is a good reserve anaesthetic in short procedures for those experienced in its use. Naval personnel at sea are good risks and free from pre-existing visceral and cardiovascular disease.

SUMMARY

1. The practice of anaesthesia in the naval base hospitals is based on standards used in modern civilian institutions, and an attempt is being made to administer modern anaesthesia to those who fight for us.

2. In our base hospital spinal and intravenous pentothal sodium satisfies 82% of our requirements for anaesthesia in routine operative procedures.

3. Spinal anaesthesia is not used in abdominal surgery where there has been marked blood loss. Here the tendency is toward cyclopropane.

4. At sea, local, spinal and intravenous anaesthesia will take care of the usual types of cases. For the untrained anaesthetist ether by the open drop method or Oxford vaporizer will be the

anaesthetic agent of choice for major surgery in the severely injured at sea.

BIBLIOGRAPHY

1. WADE, E. M.: *U.S. Naval Bull.*, 1942, 2: 367.
2. LEECH, B. C.: *Proc. Royal Soc. Med.*, 1943, p. 207.
3. PENDER, J. AND LUNDY, J. S.: *War Med.*, 1942, p. 193.
4. MALLINSON, F. B.: *The Lancet*, 1943, p. 729.
5. BIGELOW, G.: *J. Canad. Med. Services*, 1944, p. 337.
6. HERSHY, S. G. AND ROSENSTEIN, E. A.: *Anesthesia*, 1944, p. 149.
7. BOURNE, W.: *Canad. M. Ass. J.*, 1942, 46: 241.

CAUSES OF REJECTION FROM THE ARMY AND INCIDENCE OF DEFECTS IN RECRUITS*

By Lieut.-Col. F. S. Park, O.B.E., V.D., R.C.A.M.C.

CANADA has been at war for nearly 5 years and during this time a large number of men have been examined for the Army, and many have been declared medically unfit. As I have been closely associated with the examining boards at Toronto for all this time, it was thought that an analysis of our findings, showing causes for rejection, might be interesting and instructive. The recruiting medical boards are like the medical referees of insurance companies. They are employed to see that the country does not lose money by taking into the Army men who will prove bad risks.

Bad risks in the Army are those men who fail to get to the battle area through physical defect or mental unfitness. Boards are expected, by careful history taking and thorough physical examination, to form an estimate of what each man will be after he has been subjected to a course of strenuous training in strange environments, and to label him as likely to be fit for service anywhere, fit for limited service, or not fit for any service.

It is only by appreciation of the long-time point of view that certain apparent absurdities are justified. To reject "Butch Riley", the boss of a lumber camp, because he has had a discharging ear since childhood, and to accept little Billy Smith, a stripling just out of school whom the lumber-jack could break across his knee, would be poor judgment if the Germans were marching through our cities tomorrow. But

* Read at the Seventy-fifth Annual Meeting of the Canadian Medical Association, Section of Medicine, Toronto, Ont., May 25, 1944.

after a year's training in a half a dozen camps, exposed to many infections from all parts of the country, the probabilities are (and experience seems to prove it) that Riley would be a casualty in hospital because of his ear—to be discharged with a pension—while Smith, filled out and developed, proceeds overseas to fight.

At the commencement of hostilities, it seemed wise to take in many Butch Rileys, or old soldiers and N.C.O.'s in order to hold the line while the Billy Smiths grew up, and the discharge rates from the Army were high after a year or so in consequence, but we must remember that, but for the grace of God and the Royal Air Force, our Army might have been fighting desperately on the beaches and in the streets of England in 1940. I propose to show the causes for rejection in a series of tables.

I must emphasize that these tables are compiled from our own findings only and not from the other boards in M.D. 2. Table I shows category "E" men only. During this period most category "C 1", and nearly all category "C 2" were not enlisted, but officially only category "E" men were considered to be rejected.

I have compiled the tables according to the morbidity code of the Department of Pensions and National Health, with some deletions for brevity. Not to confuse you with too many

TABLE I.
REJECTIONS OF VOLUNTEERS—TORONTO

Period	1940 Feb.- Sept.	1940-1 Oct.- Sept.	1941-2 Oct.- Sept.	1942-3 Oct.- April
Recruits examined.	11,992	19,041	33,300	13,838
Category "E".....	1,712	2,785	7,193	3,155
Percentage category "E".....	14.3%	14.6%	21.6%	22.8%
System	%	%	%	%
Infections—tuber-				
closis.....	0.13	0.67	1.5	1.2
Nutrition, arthritis,				
diabetes, thy-				
roid, etc.....	0.73	0.66	1.4	1.6
Nervous system.....	0.3	0.66	2.6	4.3
Eye.....	3.1	2.6	2.3	2.1
Ear.....	3.2	2.6	2.6	2.0
Circulation.....	2.7	2.5	3.3	2.7
Respiration.....	0.23	0.6	1.1	2.3
Digestion.....	0.3	0.9	1.6	1.2
Hernia.....	1.7	2.0	2.2	1.6
G. U.....	0.3	0.3	0.5	0.5
Skin.....	0.05	0.02	0.16	0.2
Bones, accidents,				
joints, deform-				
ities.....	0.7	0.6	2.0	2.5
Total recruits examined.....	78,171			
Total recruits rejected.....	14,845			
Percentage rejected.....	18.9%			

figures, I have dealt mainly with percentages. Group I "Infections" is almost entirely tuberculosis, but does include a few cases of syphilis, as at one time no active syphilitic was enlisted. The next group includes the overweights and the underweights, the diabetics and the goitres and some of the arthritics. Our board has been more lenient with underweights than most, I think, especially in the younger men, as we know they usually put on 10 to 20 lb. in the Army in a few months. Of the nervous system I will have more to say later. Disabilities from eyes form a large and pretty constant source of rejections. Except for the occasional traumatic cataract, the cause is refractive error and although standards have been lowered from time to time, we are still exempting from the service many men whose only defect is myopia. Ears and hearing are another large source of rejection. Chronic otitis media forms the mass of these cases. In the column marked circulation, rheumatic valvular disease of the heart and hypertension make up the bulk of this figure. A few men are rejected for disorderly action of the heart or effort syndrome. A man was seldom made category "E" for varicose veins or haemorrhoids, although many were downgraded for these. Chronic bronchitis, asthma, and undoubted sinus disease are real disabilities and a bar to service. As in tuberculosis, a specially trained chest man examines the man with his x-ray film before a rejection is made. The rejection figures in the digestive column represent duodenal ulcer almost entirely. Hernia is a constant source of rejection. The genito-urinary column contains the undescended testicle, and the nephritic. We do not readily reject a man for albuminuria. Albumen must be present on several occasions, with microscopic findings in the form of casts and red blood cells to cause a rejection.

Intractable skin diseases and those likely to be a source of trouble on service are rejected. Mild psoriasis we may take. It is a controversial point with us whether a man with a disfiguring eruption on his body may not produce concern among his fellows and spoil their morale to a greater degree than his own value to the service would warrant. Disabilities of the musculo-skeletal system cause a large number of rejections. As our facilities for examination improved and we had easier access to x-ray examination, we have rejected more men for backs, arms and legs. It is our experience that a man with an organic lesion of his bones or joints

demonstrable by x-ray makes a poor risk. Sooner or later all soldiers get "fed-up", and if there is uncontrovertible evidence of something amiss, none can assert that his complaints are unjustifiable, and he must be down-graded. No other group except the nervous system has produced more arguments regarding disposal.

The increasing rate of rejection will be noted; whereas defects of eyes, ears, circulation and genito-urinary system remained fairly constant, nutritional defects doubled, defects of bones and joints tripled, digestive disorders increased 4 times, the respiratory diseases including tuberculosis increased 10 times, whilst

by several specialists, and a new system of grading was introduced. The Pulhems system has been widely publicized and I need just briefly say that P stands for physique; U for upper; L for lower and locomotion; H for hearing and ears; E for eyes; M for mental capacity; S for stability, and that Grade 1 represents fitness for service anywhere; 2 anywhere but in front line combative duty; 3 represents fitness on lines of communication; 4 represents fitness for Canadian service only; 5 represents unfitness.

Table II shows the activities of the Army reception centre, M.D. 2, for the year commencing May 1, 1943, and the grading represents the

TABLE II.
SUMMARY OF EXAMINATIONS, MAY 1, 1943, TO APRIL 30, 1944,
ARMY RECEPTION CENTRE, M.D. 2, TORONTO

Grade	1	%	2	%	3	%	4	%	5	%	Total
G. S. Recruit (A).....	8,138	36.0	3,738	16.5	2,068	9.5	3,497	15.4	5,205	22.6	22,646
N.R.M.A. Recruit (R).....	2,820	25.2	1,550	13.9	1,006	9.0	2,583	23.1	3,250	28.8	11,164
Med. only (O.M.E.).....	5,481	31.8	2,526	14.6	1,719	10.0	3,096	17.7	4,518	25.9	17,340
Revision.....	643		411		77		26		48		1,205
Civil service, etc.....	311		71		45		80		85		592

Total men examined—52,947. Total recruits—35,015.
Rejection—G.S. soldier—A — 47.5%. N.R.M.A. soldier—R — 60.9%

nervous disorders increased 14 times. I believe this increase to be due not so much to a deterioration in the quality of the recruits, as to more experience on the part of the Army. Early in 1941, an analysis of discharges of serving soldiers from England revealed a high rate of loss from duodenal ulcer, chronic bronchitis, arthritis and nervous and mental diseases. In consequence more careful histories were taken, more x-rays were taken, and more of the doubtful cases were eliminated. As the Army learned the art of modern war, the need for more brains in the ordinary recruit became apparent, and a lot of the hewers of wood and drawers of water who had made good soldiers at Vimy and Passchendale were found to be untrainable. The private soldier of this Army needs to learn more than many N.C.O.'s of 1914-18 ever knew. So the M test, an ingenious intelligence test, was introduced and every candidate was subjected to the scrutiny of a psychiatrist before enlistment. How this works out we will see later.

Just a little over a year ago, several drastic changes were introduced in the medical examination of recruits. A reception centre was formed at Toronto, where all the boarding for the District was to be done, the old 3-man board was replaced by a chain system of examination

lowest number on a man's score, e.g., Grade 2 means there is one or more 2's on his score, but no large number. Grade 5 represents one or more 5's. For example, a man showing:

P U L H E M S
2 1 4 3 1 1 4

would be graded 4 in this summary. As the Army had by this time an abundance of men in the lower grades, all men were now to be shown as rejected who had a higher number than 2 on this grading.

The G.S. soldier or A recruit is the volunteer, the N.R.M.A. or R recruit prefers to fight the Germans in Canada, if he has to fight at all. Please note that in this District there are twice as many volunteers as conscripts, and the rejection rates among them is lower. The O.M.E. represents the men sent by the Registrar N.S.S. to be graded, to be sent later to join the Army if not needed elsewhere.

I have analyzed the last 4 months of this period more intensely and Table III shows the causes for downgrading or rejection under the appropriate letters. Note that there are more disabilities than rejections, as many men are downgraded on several counts. The H or ears rate is similar to the rate found on Table I, namely about 2%, but the E or eyes is higher

TABLE III.
REJECTIONS—GRADES 3, 4 AND 5
JANUARY 1 TO APRIL 30, 1944

% A	6,493 2,858			R 3,115 1,862	%
		Recruits examined.....	Recruits rejected.....		
14.9	973	P Physique.....	P 524	16.8	
2.4	159	U (Arthritis, injuries).....	U 90	2.8	
7.2	469	L (Deformities).....	L 311	9.9	
2.3	148	H Ears.....	H 39	1.2	
6.3	412	E Eyes.....	E 125	4.0	
8.4	545	M Mental capacity.....	M 521	16.7	
16.3	1,058	S Stability.....	S 1,026	32.6	
	3,784	Total Disabilities.....		2,636	
44.0%		% Rejected		59.7%	

because a great many E3 and E4 were not classed as rejects in that table. In this group is the large number of good men with only one useful eye. It grieved my soul, the other day, to have to reject one of the current world champion wrestlers, the behemoths of the groan and grunt art, because he had an amblyopic eye. In the following tables I will elaborate on the other factors.

Table IV.—This is an analysis of the reasons grouped under the P factor, separated into the A recruit and R recruit. Note that twice as many underweights want to fight, but the hernia fellows prefer to stay out. The nervous system factor in this table represents organic defects such as epilepsy, migraine, post-traumatic syn-

TABLE IV.
REJECTIONS—GRADES 3, 4 AND 5,
JANUARY 1 TO APRIL 30, 1944
PHYSIQUE—P

Recruits	A 6,493			R 3,115	%
		Number	Recruits examined		
1.0	64	Tuberculosis.....	23	0.7	
	4	Other infections.....	1		
	6	Tumours.....	5		
2.5	166	Underweight.....	39	1.2	
	17	Overweight.....	9		
	8	Diabetes.....	6		
	12	Endocrine.....	10		
	1	Blood.....	..		
1.4	95	Nervous system.....	84	2.6	
1.75	{ 76	Heart.....	38	2.1	
	{ 37	Blood pressure.....	16		
	14	Varicose veins.....	13		
	4	Hæmorrhoids.....	1		
4.4	{ 32	Nose and sinus.....	18	3.9	
	{ 256	Bronchi and lungs.....	104		
0.7	48	Digestive tract.....	34	1.0	
1.0	79	Hernia.....	73	2.3	
0.7	50	G. U.....	31	1.0	
0.3	24	Skin.....	19	0.6	
14.9	973	Total disabilities—P	524	16.8	

dromes, etc. On the whole it is very similar to the findings in the first table.

Table V.—The U and L function grouped together. Feet account for nearly 1/3 of the disabilities. In many of these cases the actual diagnosis was not determined, as it would require more time and x-ray investigation than could be justified when the man was obviously

TABLE V.
REJECTIONS—GRADES 3, 4 AND 5
JANUARY 1 TO APRIL 30, 1944

	Upper extremity—U	L—Lower extremity
Feet.....	303	Fractures..... 161
Pes planus.....	196	Upper..... 63
Pes cavus.....	58	Lower..... 98
Hallux valgus.....	20	Dislocations..... 20
Miscellaneous.....	19	Upper..... 15
Knee joint.....	64	Lower..... 5
Arthritis.....	123	Injuries and deformities..... 188
Osteomyelitis.....	13	Upper..... 46
Congenital defects.....	17	Lower..... 142
Miscellaneous.....	111	Amputations— Upper..... 25 Lower..... 8
Total disabilities U and L	1,029	in 9,608 recruits.
Rejection.....		10.7%

unfit. The number of men rendered unfit for Army life because of old fractures and other injuries is considerable. A number of weird congenital deformities have been seen and some results of surgery cause us to feel that even the surgeons have something still to learn.

Table VI.—This shows the havoc created in our records by the psychiatrist. Among the volunteers he rejects one in every 5 and looks with a suspicious eye on another 5.8%. Three out of 4 he passes. Among the conscripts the carnage is more than twice as great. Less than 50% are beyond suspicion. In this District 2/3 of the recruits come to us as volunteers for active service and of them 3/4 are sound from a psychiatric standpoint. Of the other third who

TABLE VI.
REJECTIONS—GRADES 3, 4 AND 5,
JANUARY 1 TO APRIL 30, 1944

M AND S

	Active		N.R.M.A.	
	%	Number 6,493	Recruits examined	Number 3,115
74.5	4,839	No psychiatric disability	1,472	47.3
5.8	377	Accept for recheck.....	279	8.9
1.5	100	Grade 3, M — S.....	79	2.5
13.8	898	Grade 4, M — S.....	908	29.1
5.0	330	Grade 5, M — S.....	377	12.1
20.4	1,328	Rejected.....	1,364	43.7

remain as conscripts, more than half are considered unfit to serve by reason of psychiatric disability. In the M factor alone the A's are twice as good as the R's. This factor has to do with mental capacity only and those rejected are the mentally retarded. They could not finish public school in civil life, they cannot pass basic training in the Army.

Under the heading of S or stability, we have all gradations from the definite schizophrenic to the man who had a nervous episode in his youth. It includes the boy who has started on, or is heading for, a life of crime, and the nice boy who has never gone anywhere without his mother's approval. We find here the psychoneurotic, the neurotic and the man who enjoys poor health. It includes the boy who knows he has heart disease because some doctor told his mother that he had a murmur 20 years before, or kidney disease, because the radio announcer described "just his case", when lauding the virtues of D's kidney pills.

These unstable men are found equally among the morons and those with high M scores. They are found among high executives and day labourers. They may make brilliant poets and painters, but they make poor soldiers.

So this is the story, after the examination of more than 130,000 men. Are there any lessons for us, who are guardians of the nation's health? Medicine has made great strides even in my lifetime. Some of the dread diseases are disappearing. Many of the problems of nutrition have been solved. Surgeons are doing marvels in the extirpation of growths and infections in places formerly thought to be inaccessible. The bodies are bigger and stronger, but what about the minds and souls? Have we, in our zeal to avoid and eliminate physical ills, made our people too disease-conscious? In training the mothers to give meticulous care to the infants, have we implanted fears of illness in their minds, from which the child has never recovered? Are we giving out positive suggestions to our people or are we leaving them too much to the insistent and insidious commercial propaganda by picture and radio, which fosters self-diagnosis and self-medication? It seems to me that a vigorous educational campaign in psychiatric prophylaxis, starting with our profession, might reap great results in human happiness and efficiency.

Yet, when we are inclined to view these figures with alarm, there are two things to remember.

First, the Army is the unpopular service in this war and most of our best lads have volunteered long since and are doing valiant service with the Air Force and the Navy. The second thing is that the Army requirements are now very high. A lot of good men are not quite good enough. Not all of our sons made the first team at school. For this Army, in the war, the words of the Klondyke poet early in the century are most appropriate:

"Send not your foolish and feeble;
Send me your strong and your sane,
Strong for the red rage of battle;
Sane, for I harry them sore.
Send me men girt for the combat,
Men who are grit to the core."

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RÉSUMÉ

130,000 hommes ont été examinés selon le système PULHEMS. Chaque lettre de ce mot correspond à un temps de l'examen, P pour Physique, M pour Mental, etc. Des 6 tables reproduites dans cet article, le première exprime l'essentiel. 18.9% des recrues furent refusées du début de la guerre au 30 avril 1943. A mesure que les méthodes d'examen se perfectionnèrent, le nombre des licenciements augmenta; en 1944, il atteignait 44% pour les volontaires et 59.7% pour ceux qui s'engageait pour la seule défense du Canada. Les plus faibles pourcentages de licenciements vont aux maladies des voies génito-urinaires: 0.5% et à la peau 0.2%; les maladies des yeux et des oreilles comptent pour 2.1% et 2% respectivement; enfin, les malades du système nerveux atteignent 4.3%.

L'examen des recrues a permis une analyse intéressante dont les résultats serviront à orienter le pays en temps de paix. On aura mieux compris, notamment, l'importance des désordres neuropsychiatiques et on aura mis au point des méthodes diagnostiques et thérapeutiques qui amélioreront la santé collective du pays.

JEAN SAUCIER

THE MANAGEMENT AND PREVENTION OF RHEUMATIC FEVER*

By R. R. Struthers, M.D.

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IN presenting a communication on the management and prevention of rheumatic fever before this meeting, I should say that I do not propose discussing personal observations on this subject, but rather to comment on the more recent studies made in other centres and to discuss general principles rather than specific details. In so doing, credit is duly given in the appended references, and if any are unintentionally omitted, apology is freely offered.

Previously considered a disease particularly

* Read at the Seventy-fifth Annual Meeting of the Canadian Medical Association, Toronto, Ont., May, 1944.

of pre-school and school age children, rheumatic fever has now become a disease of late adolescence and young adult life, as is shown by the experiences in the armed forces of Canada and the United States. It has been reported that rheumatic fever in all its manifestations has been particularly frequent in the Services in the age group from eighteen to twenty-two. This suggests the need for a change in our conception of the disease as regards the age group in danger, and particularly also, a need for a long term follow-up and long-continued convalescent care. By this is meant the establishment of sanatoria similar to those associated with our conception of the modern treatment of pulmonary tuberculosis, where rest in bed over a period of months, sunlight, adequate food and the treatment of symptoms as they arise, are the main factors in recovery. There is a growing need for convalescent homes and hospitals for young adults, as well as children, who have suffered from rheumatic fever. This should include provision for a long term period of clinical observation, education in personal health rules and in possible future working conditions, and, for children particularly, the alteration of our conception of the necessity of school attendance, and of an increased value and need for thoroughness in school medical examinations; also for the education of the practitioner in the diagnosis of rheumatic fever and of rheumatic heart disease, so that fewer false diagnoses may be made and the so-called "cardiac cripple" mentality may be avoided in young patients.

Rheumatic fever is frequently a vague disease which is difficult of definition, but for purposes of this discussion, we shall assume that it is a fairly definite clinical entity which is well described as such in modern textbooks on medicine. Thus it is intended to include the acute polyarthritis, carditis and Sydenham's chorea, the triad of so-called juvenile rheumatism. In addition, I believe that we should make some attempt to establish the diagnosis of the pre-rheumatic or "unwell" child, whom we have described in previous communications. This is the child who is pale, underweight, with a poor appetite, lacking in energy, constantly fatigued, suffering from various vague aches and pains, sometimes associated with low grade fever and anaemia, and who acquires frequent minor upper respiratory infections. All these symptoms may

not be of sufficient severity to preclude some activities and attendance at school, but the striking fact is that the physical examination reveals no organic cause for the complaints. Such children, failing the finding of proof of other disease, should be considered as pre-rheumatic.

It is only by reviewing the previous histories of rheumatic children that we learn of this long continued state of lack of well being, before the symptoms of rheumatic disease come to a level where they can be recognized clinically. In my opinion, one of the more urgent aspects in the handling of the problem of rheumatic fever must be the learning of the recognition of the unwell child, before symptoms, at present unrecognized as being due to rheumatic fever, come to a definite clinical level; for only by the institution of appropriate treatment can we hope to decrease the frequency of the clinical manifestations. The management of the pre-rheumatic child would, of necessity, consider the social-economic aspects of the rheumatism problem, which we will discuss later, an intensive clinical investigation to discover evidences of chronic low grade infections and their adequate treatment, and long-continued rest, either complete or modified, until the symptoms of the unwell child have disappeared.

TREATMENT

To return to my title, firstly as regards care and management: The care of the acute illness in the first attack follows previously accepted routines, including rest in bed, local rest and heat, fluids by mouth, control of pain and fever by analgesics and hypnotics as indicated, and so on. The dose of salicylate by mouth has been under some discussion. In the rheumatism service of the Children's Memorial Hospital, we have been in the habit of administering to children a grain of salicylate per pound of body weight per day, until the acute symptoms are relieved, then halving the dose and continuing at that level until evidence of activity has disappeared. This has been moderately efficient.

Recently Coburn has reported on the intravenous use of sodium salicylate in young adults, with striking results. In brief, his method consists of the intravenous administration of sodium salicylate 10 gm. (150 gr.) in 1,000 c.c. of saline solution by intravenous drip,

either once or twice, depending on the relief the patient secures, every twenty-four hours for seven days, achieving a level of 360 micrograms of salicylate per cubic centimetre in the blood. Thereafter, 10 gm. of sodium salicylate with 6 gm. sodium bicarbonate are administered orally, daily for the next three weeks. At the end of that time the therapy is discontinued for a week, and if there is no evidence of activity, treatment is stopped. If there is evidence of continued activity, this intensive therapy by mouth is continued for a further period of two weeks. Coburn finds, using the sedimentation rate as an indication of activity, that the sedimentation rate falls to half the original level within seven days on the intravenous therapy, and is within normal limits before the end of four weeks. In the short series of cases reported by Coburn, none so treated had heart disease at the end of one year.

Recently we have learned that intravenous administration of sodium salicylate was used previously in the Argentine army from 1934 to 1939. The routine procedure was the administration of 18 gm. of sodium salicylate in 3,000 c.c. of 5% glucose solution, by intravenous drip, over a period of twenty-four hours. The patient was then given one gm. sodium salicylate (15 gr.) every two hours day and night for a period of two to four weeks, depending on the presence or absence of symptoms. A personal communication from one of the men associated with this work (Pasqualini) states that the results, as regards ultimate carditis, were less good than those reported by Coburn, and probably no better than those obtained by the usual oral administration.

As it is, however, impossible to reach and maintain a high blood level by the oral route as compared with the intravenous, it would seem that the achieving of a high level of salicylate in the blood and maintaining it there, may have some beneficial effect on the frequency of resultant cardiac disease. Our own brief experience of the intravenous method, though small, has been favourable, excepting for the frequency of evidence of intoxication, of temporary deafness, of severe acidosis in one case with CO₂ combining power of 10% and associated with delirium, all signs of salicism. This is also the experience of those who have used the method in the armed forces, Keith and Ross (personal communications). Symptoms

are quickly relieved by the stopping of the intensive therapy. The advocacy of such relatively high doses by Coburn over a period of four to six weeks after an acute attack, with the expectation of a favourable result on the frequency of heart disease, is in agreement with the dose advocated by some English observers for some years. Our own experience with the method is as yet too brief to offer any comment. Recently it has been suggested that the long-continued administration of salicylates following the onset of rheumatic infection in children, will also prevent the re-activation of the disease after respiratory tract infection. This presumes that salicylates have a direct effect on rheumatic disease, more than, as we have considered, a relief of symptoms, but rather some inhibitory effect on the disease itself.

DETERMINATION OF ACTIVITY

Our interest at the Children's Memorial Hospital has been centred on the determination of the activity of the disease, and I would again impress upon you that this is entirely a bedside and clinical, rather than a hospital procedure. The signs of well being, a gain in body weight, and recovery from the anaemia associated with active rheumatism, a normal white cell and differential count, a normal sedimentation rate in the absence of oedema, and a normal pulse rate, are the criteria of the cessation of activity which we use. In my experience, one of the striking evidences of reactivation of infection is the early and constant appearance of a severe degree of anaemia associated with this disease, which should always forewarn the practitioner of the possible recurrence of activity. It is recognized that rheumatic fever is particularly a disease of urban rather than suburban communities, and in the former, adequate laboratory facilities are usually available, but it is still feasible to make such determinations at the bedside in rural practice. This is true both of the recurrence and of the original attack.

Our local experience in the Children's Memorial Hospital with a separate pavilion for the convalescent care of children suffering from rheumatic fever has been previously described, and we are still of the opinion that patients suffering from this disease are best treated in a separate service, either associated with, or having close clinical contact with a general hospital for children, where the use of a separate pavilion

aids in the prevention of widespread infections. As the children are usually in the wards for at least three months, there are some special nursing problems. They must be taught to be passive, must be kept happy, warm and well fed, and must have physical, mental and emotional rest. The rest period before meals and the rest period from twelve noon to three in the afternoon must be enforced. The nurse in charge and her staff must watch for and report epistaxis, skin rashes, joint and abdominal pains, the appearance of nodules, signs of chorea, pallor, sweating and malnutrition.

The night nurse must carefully record the sleeping pulse at midnight and at 4 a.m. As a general rule, after the sedimentation rate has remained normal for four to six weeks, standard graded exercises are undertaken by the department of physiotherapy. Bathroom privileges and allowing the child to sit up for meals are permitted only upon request of this department. It has been noticed that after the acute infection has begun to subside, emotional outbursts become less frequent, and at the same time the physician has usually recorded improvement in the condition of the heart. Patients requiring physical examination and care by dentists, otolaryngologists, etc., receive them when needed. We have found this pavilion to be a boon in the treatment of subacute rheumatism. As with tuberculosis, rest, fresh air, sunlight and nourishing food with vitamins and iron are, so far as our present knowledge goes, the only treatment for this disease. We also feel that, as in tuberculosis, the increase in weight and the improvement in the red blood cell count and haemoglobin, is of good prognostic import.

RECURRENCE

The management of the recurrence is in part its prevention; the therapy of obvious infections such as chronically infected tonsils, the prevention of upper respiratory infection by contagion, and later the use of sulfonamides daily in small, but effective doses of 5 to 7½ gr. three times a day, over long periods of time during the fall and winter months, in children who are susceptible to rheumatic fever, and rest in bed during the period of upper respiratory infection, until all evidence of such infection has ceased. I would again remind you that sulfonamides have no place in the treatment of rheumatic fever during the active

phase of the disease. Our own experience coincides with that reported by Bland, Duckett Jones and White, that symptoms are greatly exaggerated and toxicity increased, and even death may result from the administration of sulfonamides in active rheumatic fever. They may be used with good effect during the interval between recurrences, in the prevention of active disease following respiratory infection, though they do not prevent upper respiratory infection.

It is well known that the danger of upper respiratory infection to children who have had rheumatic disease is because of the likelihood of re-activation of rheumatic fever in susceptible children. The point to be stressed is that so frequently the original attacks and recurrences of rheumatic disease follow upper respiratory infection with which the haemolytic streptococcus is associated. The danger of re-activation can best be stressed by comparing the prognosis as regards the life of a child aged five years, suffering from his first attack of rheumatic fever, and his brother aged fifteen with a similar illness. We are all aware that the prognosis for the five-year old is infinitely more grave than for the fifteen-year old. It is my belief that this prognosis is in part determined by the number of attacks of upper respiratory infection through which the five-year-old must pass, before he achieves adolescence, probably three to five per year, whereas the fifteen-year-old, having passed through this period of childhood during which "colds" are so common, is much less likely to have frequent recurrences of activity, either clinically or sub-clinically. The child who has suffered from rheumatic fever must have a long period of freedom from clinical evidence of the disease, probably at least six years, before one can declare him free from the danger of recurrence. I would also remind you that the first attack of the disease usually shapes the life-time pattern for that individual, that is to say, that the patient whose first manifestations of rheumatic fever is an acute polyarthritis, is likely thereafter in his subsequent attacks to follow the same pattern of polyarthritis and rheumatic cardiae disease.

The manifestation which we call chorea, is still difficult from a therapeutic point of view. Undoubtedly "psychic" shock to susceptible children is impossible to avoid in our modern life, and in so-called "mixed chorea" this may play a part in its etiology. Where carditis

supervenes, the therapy is, of course, directed towards the carditis, and the remarks above as regards its management and the determination of the activity of the disease process, are applicable. Usher and Jasper have shown that there is at times some abnormal basic family pattern in the electro-encephalographic tracings of those families where rheumatic chorea occurs. This would suggest a confirmation of Cheadle's observation that there is a family liability, or a true inherited tissue susceptibility for rheumatic disease, and we are all aware that in many instances it is a family disease. This point will be further elaborated in a discussion of the prevention of the disease.

PREVENTION

The prevention of rheumatic fever is, of course, dependent upon a knowledge of the etiology of the disease and the possibility of altering some of the known factors associated with its frequency. I am, of course, aware that what I have to say may be largely speculative and hypothetical, but speculation in medicine is an interesting pastime. We do know, for instance, that the frequency of rheumatic fever is associated with certain climatic conditions and that it occurs in those regions where there is a marked fluctuation in temperature and humidity during the year; that it is a disease of urban rather than suburban communities; that in young adults it tends to occur in those occupations which expose the individual to chill and damp; that it may occur more frequently in dwellings that are inadequate as regards protection from dampness and cold; that it may be distinctly a family disease in that two or more cases may occur in a given dwelling or in a given family. This last is of particular interest, when in a clinic for rheumatic children, one finds that two or three children in one family, as well as their parents, suffer from rheumatic heart disease. On the whole it would appear to be a disease of cities, of public hospital practice rather than of private practice, and to be associated with moderate degrees of economic disability and with crowding. Whether this frequency is due to inheritance of tissue susceptibility or to frequent respiratory infections, secondary to crowding, is not yet clear, but it would suggest, in view of the experiences in the armed forces, where upper respiratory infections and subsequent acute rheumatic fever are a common experience, that the crowding and infection go

hand in hand. It has been estimated that where epidemic sore throat occurs among young adults, that as many as 10% of those affected will develop acute rheumatic fever. This has been the experience of some of the men working in the armed forces and it may, under such circumstances, be considered almost an "epidemic" disease. From this it would appear that the avoidance of family overcrowding and the associated frequency of direct infection is an essential in the prevention of rheumatic fever. The means of its accomplishment is, of course, aside from the armed forces, a social-economic, rather than a medical problem, dependent on an adequate standard of living and housing.

Coburn recently reported some interesting observations on the possible relationship of diet to rheumatic fever. His findings support the probability that certain dietary insufficiencies, notably in protein, iron, calcium and vitamin A, singly, but usually in combination, may bear a definite relationship to susceptibility to this disease. Such a relationship is suggested, but not claimed. Such a possibility becomes of even greater interest when one considers the frequency of rheumatic fever as a family disease. If the family unit, all exposed to the same housing conditions, the same frequency of infection with haemolytic streptococcus, or other organisms, and subsisting on a diet lacking in the same types of food factors, develops a specific disease, it seems likely that some of the answers to the problem of rheumatism may be found. Cheadle's conception of the "rheumatic soil" as an explanation, may be quite correct, if "soil" be considered the human framework, conditioned by inheritance, diet, infection and environment. Such conclusions, if supported by later work, suggest that the prevention of rheumatic fever is a social-economic problem possible of solution by better housing, including relief of overcrowding and diminished frequency of infections, together with improved knowledge of nutrition by the public. The educated social group, adequately housed, is in no danger of deficient dietary intake of calories, protein, vitamin A, calcium, and iron, but many working class groups do live on such diets, do live in inadequate houses and do live more than "one to a room".

Selye has recently made some very interesting observations on the production of rheumatic-like lesions in experimental animals by the administration of desoxycorticosterone ace-

tate and his writings suggest that rheumatic fever may be, as he implies, a disease of "adaptation", in that it is a response on the part of the individual, in particular of his adrenal glands and his sodium balance control, to a series of insults, the eventual result of which is the production of the disease which we recognize clinically as acute rheumatic fever. This would suggest that the disease is a type of reaction in a suitable individual, which may be produced by several kinds of injury, either dietary, climatic, inherited or infective, and that the stage of the disease which we have attempted to define as the "unwell child" or pre-rheumatic child, may be simply the sub-clinical signs and symptoms of the insults the child's body has received, which, as the insult progresses, eventually produces the manifestations which we are able to recognize clinically as acute rheumatic fever.

This is granted to be purely hypothetical, but is worthy of consideration, in that we have firstly, the inherited tissue susceptibility (family disease) secondly, the insult of inadequate housing or inadequate food, or inadequate protection from inclement weather, or chronic fatigue, or infection with the haemolytic streptococcus, and finally the full flowering of the disease which we call acute rheumatic fever. I stress this point because of our frequent errors in diagnosis and the failure on the part of our profession to recognize the early manifestations of rheumatic disease, particularly in children, and I am anxious that you give thought to the possibility of early recognition of the pre-rheumatic or unwell child. This diagnosis can only be made by constantly keeping in mind the possibility that the child with the minor, but obvious symptoms noted above, is a possible candidate for rheumatic heart disease.

The prevention of rheumatic fever then requires, firstly: the education of the profession in the recognition of the early symptoms and the environmental factors leading to the full development of the disease and the necessity for long continued care and control of the patient for the prevention of recurrences. Secondly, the education of the public in becoming as "rheumatic fever-conscious" as they are at present tuberculosis- and syphilis-conscious. The public is unaware of the frequency of this disease, though its death rate is only exceeded by pneumonia, tuberculosis and syphilis. It produces

four to five times the death rate of whooping cough and other infectious diseases combined, and a general death rate of about five per hundred thousand of all children per year. As a cause of death in childhood it is exceeded only by appendicitis and accidents. In the age groups from five to fifteen, it is estimated that there are two cases per thousand per annum, and that in the United States there are between 350 and 700 cases of rheumatic heart disease per hundred thousand population. The public must be made aware of the frequency and seriousness of this disease and they must also be made aware of its relation to faulty nutrition, faulty housing, crowding and infection. In some unpublished data collected in 1942, and which I am using with permission of Surg.-Lieut. John Keith, various school examining officers report widely varying figures on the frequency of rheumatic heart disease in Canadian school children: from 0.7 to 3.28%. This suggests that various physicians used various criteria in determining the presence of rheumatic heart disease, and bears out my suggestion that the need is for more and better training of the physicians, for an increased sense of the value and thoroughness of the school health examination so that fewer false diagnoses may be made.

I am aware that where a group in a community become interested in the study of rheumatic fever, there is a danger of over-enthusiastic diagnosis and any child with a functional cardiac murmur may be turned unnecessarily into a temporary cardiac cripple, by being put at rest unnecessarily. This must and can be avoided by better medical training and the placing of the school health examination on its proper level, a much more important one than it now occupies. Thirdly, it requires for its prevention, public campaigns for its recognition and treatment, and programs for the control of funds, which may be provided for the solving of local problems such as housing, for nutrition and for research. Of these three, the education of the public by means of addresses to lay groups, is probably the most needed.

Finally, it requires in my opinion, the provision of a national registry on rheumatic fever, so that cases can be reported to a central authority as they are found, so that some reasonably accurate estimate of the size of the rheumatic fever problem in Canada can be made. This is in contradistinction to making

rheumatic fever a "reportable" disease. In such a national registry, each reported case would receive a serial number, and some information concerning the manifestations, and a clinical outline of the case, noted. With each recurrent attack, his original history sheet would be added to; whereas if he were simply reported to the public health authority as a case of rheumatic fever each time he had a recurrence, he would be considered a new case and no real information would be gained concerning the size of the problem. I would suggest that our Canadian Medical Association or the Paediatric Section should undertake the task of maintaining such a registry.

BIBLIOGRAPHY

1. STRUTHERS, R. R. AND BACAL, H. L.: *Canad. M. Ass. J.*, 1933, 29: 470; *ibid.*, 1934, 31: 603; *ibid.*, 1936, 35: 258.
2. COBURN, A. F.: *Johns Hopkins Hosp. Bull.*, 1943, 73: 435.
3. ONTANEDA, L. E., ARGIBAY-MOLINA, M. AND FERLONI, A.: *Actas y Trabajos, V Congreso Nacional de Medicina, Rosario, Argentina*, 1934, 4: 326.
4. ONTANEDA, L. E., GARCIA DEL RIO, J. AND ARGIBAY-MOLINA, M.: *ibid.*, 1934, 4: 335.
5. ONTANEDA, L. E. AND ARGIBAY-MOLINA, M.: *ibid.*, 1934, 4: 342.
6. PASQUALINI, P. Q.: Personal communication.
7. KEITH, J. AND ROSS, A.: Personal communication.
8. STRUTHERS, R. R. AND BACAL, H. L.: *Canad. M. Ass. J.*, 1938, 38: 227.
9. JONES, T. D. AND MOTE, J. R.: *J. Am. M. Ass.*, 1939, 113: 898.
10. BLAND, E. F., JONES, T. D. AND WHITE, P. D.: *J. Am. M. Ass.*, 1936, 107: 569.
11. USHER, S. J. AND JASPER, J. H.: *Canad. M. Ass. J.*, 1941, 44: 365.
12. CHEADLE, W. B.: *Lectures on the Practice of Medicine*, Smith Elder, London, 1908.
13. COBURN, A. F. AND MOORE, L. V.: *Am. J. Dis. Child.*, 1943, 65: 744.
14. SELYE, H. AND PENTZ, E. I.: *Canad. M. Ass. J.*, 1943, 49: 267.
15. HADLEY, O. F.: *Pub. Health Rep.*, 1939, 54: 2271.
16. KEITH, J.: Personal communication.
17. PASQUALINI, R. Q. AND DONNES, A. V.: *Revista Argentina de Cardiología*, 1943, 9: 367.

Children's Memorial Hospital.

RÉSUMÉ

La fièvre rhumatismale est une affection qui dépasse les cadres de l'enfance; on la retrouve assez fréquemment chez le jeune adulte et dans l'armée. On connaît mieux la phase préhumatismale et on peut, dans une certaine mesure, prévenir la maladie. Les sulfamides constituent un bon préventif. Contre la maladie déclarée, on préconise toujours le salicylate de soude à doses élevées selon diverses techniques décrites en détail. L'anémie est un bon signe de rechute imminente. On préviendra les manifestations rhumatismales en surveillant les voies respiratoires supérieures, en combattant les foyers infectieux, en instituant à propos la sulfamidothérapie, en améliorant les conditions du logement, enfin, en éduquant le public.

JEAN SAUCIER

Money is needed as well as guns for the final Victory Drive — Invest in Victory.

THIOURACIL IN THE TREATMENT OF THYROTOXICOSIS*

By E. LOZINSKI, M.Sc., M.D., C.M. and J. SIMINOVITCH, B.Sc., M.D., C.M.

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RECENT literature contains a number of reports extolling the value of thiouracil in the treatment of thyrotoxicosis, and while some of these have indicated the necessity for caution in its use, many have failed to lay sufficient emphasis on possible toxic manifestations. It is for this reason that the present report, which includes observations on a case developing fatal agranulocytosis, is presented.

HISTORY

The observation has been made that the sulfonamides, thiourea and thiouracil, when administered in relatively large doses to experimental animals produce enlargement of the thyroid gland.

In the rat for example, moderate thyroid enlargement and a fall in basal rate may be observed within a few days, and if treatment is prolonged for a few weeks, the thyroid enlargement and fall in basal rate become quite marked. Grossly the thyroid appears large and reddened. On histological examination, increase in vascularity and hyperplasia are immediately noted, the degree of which varies with the dose and length of time of treatment. The acinar cells are increased in size and number, and in some instances may be seen to encroach on the acinar spaces which are for the most part free of colloid. In animals treated for several months, glands occasionally exhibit irregularities of structure but still present an orderly cellular arrangement, and no changes suggestive of neoplasia are observed. Upon cessation of treatment glands rapidly regress towards a normal condition and the basal rate returns to normal.

The following facts have been established as to the mode of action of thiouracil. (1) The administration of iodine does not prevent the development of the changes described above. (2) The administration of desiccated thyroid or

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The authors are indebted to Messrs. Charles E. Frosst & Co., for the thiouracil.

Presented in part before the Montreal Clinical Society, April, 1944.

thyroxine completely prevents them. (3) Administration of thyroxine or desiccated thyroid after the changes have been established completely reverses them. (4) Ablation of the pituitary glands prevents the changes in the thyroid gland but does not interfere with the fall in basal rate. (5) In treated animals the thyroid does not take up iodine in the normal manner. (6) Histological examination of the pituitary gland of treated animals shows the cellular organization characteristic of that observed in thyroidectomized animals.

From these observations it is concluded that the group of substances under consideration act by preventing the formation by the thyroid of its specific hormone. As a result of this a fall in basal metabolism occurs, the pituitary response is as to thyroidectomy and it secretes an increased amount of thyrotrophic hormone. This thyrotrophic hormone, in turn, causes an increase in the activity of the thyroid, which however, responds by hyperplasia without increased specific hormone production.

The clinical implications of these experiments were quickly recognized. Drugs were available which could apparently selectively block thyroid secretion. Their employment, therefore, in the treatment of hyperthyroidism was undertaken as an experimental procedure.

Of the entire group of drugs manifesting this activity on the thyroid, thiouracil and thiourea were selected as being the most potent and least toxic, and of these two compounds thiouracil has received the most attention.

Thiouracil is rapidly absorbed and rapidly excreted. When 200 mgm. are given at intervals of four hours, it requires about 24 hours to reach a constant blood level and a constant rate of excretion in the urine. With this dosage a blood level of about 3 mgm. % is reached and 300 mgm. is excreted in the urine per 24 hours. No thiouracil is excreted in the stool, absorption appears to be complete. Studies on the distribution in the tissues show concentrations of 1 to 3 mgm. per 100 gm. of dry fat-free weight. The adrenal glands, bone marrow and pituitary gland contain higher concentrations than other tissues.

TOXIC EFFECTS

In experimental animals, in addition to the effects attributable to effects mediated through the thyroid gland, granulocytopenia has been observed. In the human subject, a fall in white

cell count, agranulocytosis, skin rashes and hyperthermia have been reported. Regression of these untoward effects, for the most part, follows promptly on discontinuance of the medication. However, there are several reports of the development of a fatal agranulocytosis.

CLINICAL

At the present time it may be said that thyrotoxic patients may be prepared for operation with thiouracil in the same manner in which iodine is presently used. Following administration of thiouracil the basal rate falls, weight becomes stabilized or increased, blood cholesterol rises and the general condition of the patient is much improved in a period of 10 to 24 days. If a patient has previously been given iodine, a much longer latent period occurs before full effects are evident, 3 to 5 weeks being required. The explanation for this increased latent period is that the active thyroid hormone presumably stored in the colloid, requires this length of time to be metabolized.

There are patients ill with thyrotoxicosis for whom surgical treatment is best avoided or postponed. These include especially, patients regarded as "bad surgical risks", patients who have had recurrence of their symptoms after a subtotal thyroidectomy and those patients who refuse operation. Another group requiring consideration for medical management are those young individuals who develop thyrotoxicosis acutely sometimes as a result of an acute emotional disturbance or other less obvious cause, and in whom goitre and toxic signs must be regarded as symptoms of a disease rather than the disease itself.

Medical procedures in vogue include change in scene, bed rest, dietotherapy, exhibition of iodine and x-ray therapy. The results obtained have sometimes proved very satisfactory, more often very disappointing, and these patients have been submitted ultimately to surgical treatment.

For these groups of patients treatment with thiouracil may prove of distinct advantage. Clinical data so far are only suggestive and do not permit definite conclusions. This much however, can be stated: (1) Patients improve in health, gain in weight and strength, and may return to their normal occupation. (2) The basal rate can be reduced to normal levels. (3) Blood cholesterol rises from the low levels associated with thyrotoxicosis to normal values.

(4) Blood iodine returns to a normal level. (5) Patients may be maintained in remission for as long as thiouracil is administered. (6) Cessation of medication is followed by return of symptoms in cases so far reported. (7) There are a few reports of untoward effects, namely skin rashes, hyperthermia, decreased white cell count and agranulocytosis. (8) No one should undertake to treat patients with thiouracil unless continuous observation is possible and regularly repeated determinations of the basal metabolic rate and blood examinations may be made.

ADMINISTRATION AND DOSAGE OF THIOURACIL

When treatment with thiouracil was first introduced it was suggested that 0.5 to 1 gm. of thiouracil be administered daily in divided doses until the basal metabolic rate returns to within normal limits. This may require from 2 to 4 weeks of continuous medication. The dose is subsequently reduced by stages—0.3 to 0.5 gm. per day for one to two weeks. If the basal

established and in one hypermetabolism was present but a diagnosis of thyrotoxicosis could not be made.

CASE 1

A.G., female, aged 54. Diagnosis—thyrotoxicosis.

Admitted to hospital October 26, 1943, complaining of palpitation, loss of weight, and breathlessness of 6 months' duration. Pulse was grossly irregular. There was tremor of the extended fingers and protruded tongue. The skin was warm and moist. She was very nervous and excitable. The thyroid was enlarged and somewhat nodular. The heart was slightly enlarged to the left, a coarse systolic murmur was present. The liver was palpable 4 cm. below the costal margin. There was slight oedema of the legs up to the knees. October 27, 1943, basal rate +72%, pulse rate 110, weight 121 lb. She was given Lugol's solution and by November 17, 1943, the basal rate fell to +35%. Weight 110 lb. A partial thyroidectomy was planned and this was done on November 19. The patient made an uneventful recovery and it was planned to do the second stage of the operation but the patient insisted on going home for a rest. Discharged December 14, 1943. On January 18, 1944, she was referred to the Metabolism Clinic and was selected for treatment with thiouracil. Table I shows the significant laboratory data. It will be noted that the response to thiouracil was very dramatic. The basal metabolic rate fell to normal and the patient gained 22 lb. in two and one-half months.

TABLE I.
CASE 1, A.G., FEMALE, AGE 54. HOSPITAL NO. OPD 21832

Date	Basal metabolic rate	Weight lb.	Pulse	Cholesterol	Red blood cells millions	White blood cells thousands	Hæmoglobin	Dose of thiouracil daily
Jan. 24, 1944...	+51.8	113	..	97.5	4.2	6.9	80.0	500 mgm.
Feb. 1, 1944...	+40.3	112	72	..	..	..	..	500 mgm.
Feb. 8, 1944...	+38.9	114	75	105.0	..	..	..	800 mgm.
Feb. 15, 1944...	+34.4	111	72	..	4.7	7.2	92.0	800 mgm.
Feb. 22, 1944...	+33.3	117	72	140.0	..	..	..	800 mgm.
Feb. 29, 1944...	+22.1	123	72	114.0	..	..	..	800 mgm.
Mar. 7, 1944...	+21.4	125	62	..	..	..	..	800 mgm.
Mar. 14, 1944...	+11.8	127	65	160.0	4.6	6.8	90.0	800 mmg.
Mar. 21, 1944...	+4.5	130	50	..	..	..	..	200 mgm.
April 4, 1944...	+14.4	134	52	165.0	..	..	..	100 mgm.
April 18, 1944...	+27.0	134	68	142.0	..	..	..	300 mgm.

metabolic rate remains stationary or continues to fall the dose should be further reduced. The maintenance dose may be found to be between 0.1 and 0.3 gm. per day. By this method patients have been maintained in remission for many months. More recently it is recommended that 0.6 gm. in divided doses be administered daily for two weeks and that the dose be then reduced to 0.4 to 0.3 gm.

At this time it is again emphasized that patients must be under continuous observation. Time must give the answer as to whether the drug may be withdrawn eventually without return of symptoms.

We have treated five patients. In four of these a diagnosis of thyrotoxicosis was definitely

Comment: 100 mgm. daily was insufficient to maintain this patient in remission and because at about this time a fatal agranulocytosis developed in one of our cases, No. 5, she was admitted to the hospital and submitted to subtotal thyroidectomy from which she made an uneventful recovery.

CASE 2

H.F., male, aged 51. Diagnosis—hypermetabolism.

Came to the Out-Patient Department July 27, 1943. Known to have had diabetes for past 6 months, and was taking crystalline insulin 16-0-16, and a diet of approximately 1,500 calories. He complained of nervousness and pain in the legs. Physical examination: weight 101, pulse 120, blood pressure 185/100. Lungs: bronchovesicular breathing, scattered dry râles throughout. Heart sounds clear and regular. Loud systolic murmur at apex. Liver enlarged one handsbreadth below costal margin. Knee jerks active. Skin cool and moist.

TABLE II.
CASE 2, H.F., MALE, AGE 51. HOSPITAL No. OPD 21214

Date	Basal metabolic rate	Weight lb.	Pulse	Cholesterol	Red blood cells millions	White blood cells thousands	Hæmoglobin	Dose of thiouracil daily
Oct. 12, 1943...	...	..	95	136.0	4.9	9.6	94.0	
Oct. 31, 1943...	+38.0	98	..	115.0	..	..	..
Jan. 11, 1944...	+20.2	100	..	135.0	..	..	..
Jan. 27, 1944...	+23.0	95	..	135.0	..	..	..
Feb. 1, 1944...	..	..	..	..	..	..	..	500 mgm.
Feb. 8, 1944...	+44.1	95	105	..	..	..	..	800 mgm.
Feb. 15, 1944...	+45.7	95	115	..	4.9	7.9	96.0	800 mgm.
Feb. 22, 1944...	+23.0	95	118	136.0	..	..	..	800 mgm.
Feb. 29, 1944...	+29.0	94	112	130.0	..	..	..	800 mgm.
Mar. 7, 1944...	+18.6	96	118	..	..	..	..	800 mgm.
Mar. 14, 1944...	+31.4	95	120	148.0	4.7	8.2	92.0	800 mgm.
Mar. 21, 1944...	+20.6	97	110	..	..	..	..	800 mgm.
Mar. 28, 1944...	+35.2	98	120	150.0	..	..	..	800 mgm.
April 11, 1944...	+38.5	97	130	..	..	..	..	Discontinued.
April 25, 1944...	+39.6	100	125	..	..	..	..

Coarse tremor of extended fingers. The diabetes was adequately controlled, but on account of the rapid pulse and coarse tremor it was decided to do a basal metabolic rate. The reading was +38%. However, the clinical picture was not clear cut and nothing was done about this except that the rate was repeated January 18, 1944, when it was found to be +20%. He was placed on thiouracil therapy and after two months' treatment thiouracil was discontinued. The laboratory data are given in Table II.

Comments: It will be noted that in this case in which the diagnosis of thyrotoxicosis could not be established there was a total lack of response to medication.

CASE 3

J.L., male, aged 63. Diagnosis—thyrotoxicosis.

The patient had a history of tuberculosis dating back 12 years, and had had a three-stage thoracoplasty. Has also a history of peptic ulcer. He had several bouts of haemoptysis, and on bronchoscopy an ulcer of the trachea was found. It was cauterized. Three months before admission to the hospital patient had bouts of palpitation. Spent 2 months in bed on his doctor's advice. A week before admission, January 21, 1944, basal metabolic rate was +47%. He was admitted to the hospital for further investigation, when a diagnosis of thyrotoxicosis was made and the patient was given Lugol's solution. He responded to the medication

in the usual manner, and this served to confirm the diagnosis. He was placed on thiouracil and the significant laboratory data are given in Table III.

Comment: It will be noted that there was a fairly prompt response to the drug, the basal rate dropping to -14% with a gain in weight and general improvement in his physical condition. The drug was discontinued when our case 5 developed agranulocytosis, and he was admitted to the hospital with the intention of submitting him to a subtotal thyroidectomy.

CASE 4

W.T., aged 50. Diagnosis—thyrotoxicosis.

The patient was admitted to the ward on February 24, complaining of loss of weight and weakness of one month's duration. He was perfectly well until 1 month ago when he noticed that he had lost 10 to 12 pounds in weight. He was nervous and felt weak in the legs on walking upstairs. He was intolerant of heat. Examination showed a bright-eyed eager looking patient with no exophthalmos. The tongue was protruded in the mid-line with slight tremor. The thyroid showed some diffuse enlargement and there was tremor of the extended fingers. Pulse rate 120. Basal metabolic rate February 25, +45%. Patient was treated with thiouracil from March 15 to May 2. The basal rate dropped

TABLE III.
CASE 3, J.L., MALE, AGE 63. HOSPITAL No. OPD 12652

Date	Basal metabolic rate	Weight lb.	Pulse	Cholesterol	Red blood cells millions	White blood cells thousands	Hæmoglobin	Treatment
Feb. 9, 1944...	+38.7	114.0	88	%	..	..	..	Lugol's solution.
Feb. 11, 1944...	+40.7	114.5	95	..	..	..	..	Lugol's solution.
Feb. 17, 1944...	+18.1	117.5	72	..	..	..	..	Lugol's solution.
Feb. 22, 1944...	+15.4	118.0	68	..	..	..	..	Lugol's solution.
Mar. 3, 1944...	+10.4	120.5	70	..	..	..	..	Lugol's solution.
Mar. 21, 1944...	+29.1	126.0	82	116.3	..	..	..	Lugol's discontinued.
Mar. 23, 1944...	+18.1	124.5	..	..	..	..	..	Thiouracil, 900 mgm.
April 16, 1944...	+21.0	125.0	..	..	5.8	9.8	112.0	Thiouracil, 900 mgm.
April 18, 1944...	+15.6	125.5	..	90.0	..	..	..	Thiouracil, 900 mgm.
April 20, 1944...	+1.3	127.5	..	..	..	..	..	Thiouracil, 900 mgm.
April 25, 1944...	..	..	..	..	5.7	9.6	112.0	Thiouracil, 400 mgm.
May 2, 1944...	-14.0	130.0	..	..	..	..	..	Thiouracil, 200 mgm.

TABLE IV.
CASE 4, W.T., MALE, AGE 50. HOSPITAL NO. OPD 22113

Date	Basal metabolic rate	Weight lb.	Pulse	Cholesterol	Red blood cells millions	White blood cells thousands	Hæmoglobin	Dose of thiouracil daily
Feb. 25, 1944..	+45.0	115	95	%	...	...	...
Feb. 28, 1944..	+32.7	116	85	...	4.8	6.8	94.0	
Mar. 3, 1944..	+37.4	117	88	...	...	...	...
Mar. 6, 1944..	+43.4	118	96	...	...	...	...
Mar. 15, 1944..	+28.6	119	78	139.0	...	...	...	900 mgm.
Mar. 22, 1944..	...	...	...	...	...	...	...	Discontinued.
Mar. 26, 1944..	+42.2	121	...	...	...	...	...	900 mgm.
April 4, 1944..	+35.7	120	80	169.0	5.1	6.8	99.0	900 mgm.
April 11, 1944..	+30.5	121	85	151.8	...	...	...	900 mgm.
April 18, 1944..	+23.0	120	75	120.0	...	...	...	900 mgm.
April 25, 1944..	+39.6	120	90	...	5.1	7.2	98.0	900 mgm.
May 2, 1944..	+17.0	123	...	...	...	...	...	900 mgm.

to +17% and he was submitted to subtotal thyroidectomy from which he made an uneventful recovery.

CASE 5

D.K., female, aged 49. Diagnosis—recurrent hyperthyroidism.

Patient had a hemi-thyroidectomy in August, 1939, from which operation she made a good recovery and was relatively well for a while, but subsequently lapsed into indifferent health. She was admitted to the hospital on February 17, 1944, with a history of an episode, the description of which was like that of a coronary thrombosis. The important physical findings were, marked weakness, pulse rate 110, grossly irregular, electrocardiogram showing auricular fibrillation. Blood pressure 140/80. Systolic murmur. There was tremor of the extended fingers and slight exophthalmos. Basal rates ranged between +39% and +30%. Response to Lugol's solution was prompt. Lugol's solution was discontinued and she was discharged from hospital. Three weeks later the basal metabolic rate was +46%. She was placed on thiouracil and responded as shown in Table V.

It will be noted that within a period of 3 weeks the basal metabolic rate had fallen to +15% and the patient's condition was much improved. On May 6, she felt weak and depressed and on the following day she had a severe chill with fever, headache, weakness and loss of appetite. On May 8, a sore throat developed with difficulty in swallowing. Her neck was swollen and painful. She consulted her family physician who at once recognized the possibility of agranulocytosis. A white cell count showed less than 1,000 cells. Patient was admitted to hospital May 9. The significant findings were: temperature 102.2° F., pulse 160, irregular, respirations 35. Mouth opened with difficulty. Few dirty carious teeth present. Tongue heavily coated.

Tonsils enlarged and inflamed. Pharynx fiery red. Neck swollen, painful; palpable lymph nodes in submaxillary areas. Respiratory system—fine moist râles at both bases. Circulatory system—heart not enlarged to percussion, no murmurs defined. Slight pitting oedema of legs. Red blood count, 5,300,000. Hæmoglobin 102%. White blood count 900. Not an intact granulocyte could be seen. Direct smear from throat showed masses of fusiform bacilli and Gram-positive cocci in pairs.

Patient was energetically treated with pentnucleotide, crude liver extract and transfusions with fresh whole blood, in spite of which the temperature remained high, swelling of the neck increased and no appreciable effect on the blood picture occurred. The neck was incised over a fluctuating area and as was to be expected, no pus was obtained, necrotic tissue only being encountered. Patient went downhill and expired 16 days after onset of illness with a terminal pneumonia.

Autopsy.—The significant findings in relation to the therapy with thiouracil and the agranulocytosis were in the histopathology of the necrotic tissue in the neck, the thyroid, bone marrow, and lungs, the left lower lobe of which contained several small abscesses. These will be described.

Lungs.—Section through the left lower lobe showed the great majority of the alveoli to contain variable amounts of exudate in which distinctly recognizable polymorphonuclear leucocytes are present. These are of the adult variety and are neutrophilic in character. This section also contains a well-defined abscess with destruction of the alveolar walls and the abscess cavity contains moderate numbers of disintegrating though recognizable adult polymorphonuclear leucocytes.

Thyroid.—Section taken through the remaining right lobe of the thyroid reveals a definite increase in cellularity. The great majority of the acini are irregular

TABLE V.
CASE 5, D.K., FEMALE, AGE 49. HOSPITAL NO. OPD 4275

Date	Basal metabolic rate	Weight lb.	Pulse	Cholesterol	Red blood cells millions	White blood cells thousands	Hæmoglobin	Treatment
Feb. 22, 1944..	+30.0	159	72	%	...	7.9	100.0	
Feb. 24, 1944..	+39.0	159	70	...	...	...	...	Lugol's solution, 5 min. t.i.d.
Feb. 28, 1944..	+30.0	158	65	...	...	...	...	Lugol's solution, 5 min. t.i.d.
Mar. 6, 1944..	+21.0	159	68	...	...	...	...
Mar. 9, 1944..	+18.5	161	75	...	...	...	...
Mar. 13, 1944..	+17.6	160	75	...	...	...	...	Lugol's discontinued.
April 4, 1944..	+46.8	160	78	97.5	5.8	6.4	102.0	Thiouracil, 900 mgm.
April 11, 1944..	+26.2	159	75	118.7	5.5	10.4	107.0	Thiouracil, 900 mgm.
April 18, 1944..	+21.5	160	70	136.0	...	...	...	Thiouracil, 900 mgm.
April 25, 1944..	+15.2	160	68	...	5.4	10.2	99.0	Thiouracil, 900 mgm.
May 2, 1944..	+15.0	162	...	...	...	...	...	Thiouracil, 900 mgm.

in size and shape and are lined by tall columnar epithelial cells, which show fraying of the free edge and contain no colloid. In numerous places only poorly defined attempts at acinar differentiation are present and the cells lie in somewhat undifferentiated masses. Scattered between these acini occasional large acini filled with variable amounts of pink staining colloid and lined by somewhat flattened cells are encountered. In a few situations focal collections of lymphocytes are encountered within the stroma. Blood vessels are hyperemic throughout but in no situation is there any invasion of vascular spaces by epithelial elements.

Neck tissue.—Two sections taken from the edge of the necrotic mass of tissue in the neck show large quantities of necrotic and haemorrhagic adipose tissue which is diffusely infiltrated by large numbers of inflammatory cells. While many of these are lymphocytes and round cells, considerable numbers of polymorphonuclear leucocytes can be identified. One mass contains an adjacent lymph node which is the seat of abscess formation, and here numerous polymorphonuclear leucocytes are encountered.

Bone marrow, sternum.—Sections of sternal bone marrow stained with haematoxylin and eosin and Giemsa show a distinctly cellular marrow in which however there appears to be a slight increase of fat. The bone marrow shows numerous cells of both red and white series. Megakaryocytes are absent. There is no increase in number of large pale root cells of the reticulo-endothelial type. In the red blood cell series numerous erythroblasts and normoblasts can be identified and in the white blood cell series of the granular type, myeloblasts and myelocytes can be identified but adult forms beyond myelocyte series are not present.

Vertebræ.—Section through one of the lumbar vertebrae shows a moderately cellular fatty marrow in which the picture is essentially the same as that described in the sternum.

Rib.—Section of rib marrow shows essentially the same picture as that described in the sternum. Here also cells of the red blood cell series are present and a rare megakaryocyte is seen but maturation of the white blood cells beyond the myelocyte stage cannot be identified.

Long bones.—Sections taken from the mid-portion of the humerus and fibula show in each a fatty and relatively acellular bone marrow in which only a few scattered normoblasts are present.

Comment: In this patient the response to thiouracil was prompt and the clinical improvement highly gratifying. However, the agranulocytosis which developed after approximately one month of treatment serves to emphasize that from the point of view of long term treatment, thiouracil must be used with great circumspection. It would seem that the agranulocytosis may develop quite explosively and in a very short time become irreversible.

The peripheral blood appeared to be devoid of polymorphonuclear leucocytes and further, other white cell elements were greatly reduced in number. The fact that some mature granulocytes were identified in exudates in the lung and necrotic tissues of the neck indicates however that some mature granulocytes were still being produced. The bone marrow histology suggests arrest at the myelocyte stage of granulocyte development.

The histopathology of the thyroid showed those changes already described in the literature as being characteristic of the action of thiouracil.

DISCUSSION

The response to thiouracil in the cases reported closely followed those already reported in the literature, and at the outset raised a hope that in thiouracil we had available a chemotherapeutic agent which would offer a very satisfactory drug for the management of thyrotoxicosis, more especially in patients unsuitable for surgery and for those in whom the thyrotoxicosis may be regarded as a temporary episode in whom it was only necessary to break a vicious cycle to effect permanent remission. This may still be the case. However, the development of a fatal agranulocytosis in our small series of cases has greatly dampened our enthusiasm for this treatment. There remains the hope that some means of preventing the development of agranulocytosis may present itself. Such a possibility is suggested by the fact that in experimental animals, agranulocytosis may be prevented from developing by the concomitant administration of crude liver extract, the active principle of which may be related to folic acid.

SUMMARY AND CONCLUSIONS

The results of the treatment of four cases of thyrotoxicosis and one case of hypermetabolism with thiouracil are recorded. One of the treated patients developed an agranulocytosis from which she died. Thiouracil is a drug to be used with extreme caution.

The authors are indebted to Dr. M. A. Simon for the histopathological description.

BIBLIOGRAPHY

EXPERIMENTAL

1. ASTWOOD, E. B., SULLIVAN, J., BISSELL, A., TYSLOWITZ, R.: *Endocrinology*, 1943, 32: 210.
2. ASTWOOD, E. B.: *J. Pharmacol. & Exper. Therap.*, 1943, 78: 79.
3. BAUMANN, E. -J., METZGER, N. AND MARINE, D.: *Endocrinology*, 1944, 34: 44.
4. HUGHES, A. M.: *Endocrinology*, 1944, 34: 69.
5. CHU, J. P.: *Endocrinology*, 1944, 34: 90.
6. HUGHES, A. M. AND ASTWOOD, E. B.: *Endocrinology*, 1944, 34: 138.
7. LEBLOND, C. P.: *Proc. Soc. Exper. Biol. & Med.*, 1944, 55: 114.
8. MEYER, A. E., COLLINS, M. B. AND MARINE, D.: *Proc. Soc. Exper. Biol. & Med.*, 1944, 55: 221.
9. GOLDSMITH, E. D., GORDON, A. S., FINKELSTEIN, B. A. AND CHARIPPER, H. A.: *J. Am. M. Ass.*, 1944, 125: 847.

CLINICAL

1. ASTWOOD, E. B.: *J. Am. M. Ass.*, 1943, 122: 78.
2. WILLIAMS, R. H. AND BISSELL, G. W.: *New Eng. J. Med.*, 1943, 229: 97.
3. HIMSWORTH, H. P.: *The Lancet*, 1943, 2: 465.
4. RAWSON, R. W., EVANS, R. D., MEANS, J. H., PEACOCK, W. C., LERMAN, J. AND CORTELL, R. E.: *J. Clin. Endocrinology*, 1944, 4: 1.
5. NEWCOMB, P. B. AND DEANE, E. W.: *The Lancet*, 1944, 1: 179.
6. GABRILLOVE, J. L. AND KERT, M. J.: *J. Am. M. Ass.*, 1944, 124: 504.
7. WELSHMAN, B. C.: *The Lancet*, 1944, 1: 195.
8. ST. JOHNSTON, C. R.: *The Lancet*, 1944, 2: 42.
9. WATSON, E. M. AND WILCOX, L. D.: *Canad. M. Ass. J.*, 1944, 51: 29.
10. MCGREGOR, J. K.: *Canad. M. Ass. J.*, 1944, 51: 37.
11. MARTIN, E. M.: *Canad. M. Ass. J.*, 1944, 51: 39.

**PANCREATIC NECROSIS IN ETHYL
ALCOHOL, METHYL ALCOHOL
AND ARSENIC POISONING***

By Arnold Branch, M.D.

Saint John, N.B.

THERE are numerous reports to indicate that ethyl alcohol intoxication bears some relationship to pancreatic necrosis. Thus Archibald,¹ in his chapter on the Pancreas in Nelson's Loose Leaf Medicine, quotes Symmers (1917) as listing 31 instances of sudden death, associated with habitual drinking calling for a coroner's autopsy, in which this lesion was found. Weiner and Tennant² in a statistical study found that in 66% of 38 cases of acute pancreatitis alcohol was a probable factor; in 51 cases of acute alcoholism about half showed acute pancreatic lesions. They furthermore observed that there was no direct relation between the amount of alcohol consumed and the development of pancreatic necrosis. The lesion in the pancreas may be the direct or contributory cause of death. It is not known how the alcohol acts, whether as a protoplasmic poison on the cells directly, or secondarily from obstruction to the duct by a duodenitis, or spasm of the sphincter of Oddi with back pressure and entrance of pancreatic enzymes into the tissue spaces. Another suggestion is that persistent vomiting may cause regurgitation of duodenal contents into the pancreatic ducts. Clark³ reported 44 cases of pancreatitis in acute and chronic alcoholism from the records of the Chief Medical Examiner of the City of New York and gives the incidence from the service of the Bellevue Hospital as 27 in 150 cases. In his experience all the cases of

massive necrosis occurred after an acute debauch and in 23 of the 44 cases was the cause of death or contributory. I have found no reference in a survey of the literature of the last five years to the presence of pancreatic necrosis in methyl alcohol and arsenic poisoning, both of which however are potent protoplasmic poisons.

Ethyl alcohol poisoning.—I have observed the lesions of pancreatic necrosis in only three of several cases of alcoholism. All were cases of sudden death in which post-mortem examination was ordered by the coroner. In the first, 10 hours post mortem, no tests were made for alcohol, the protocol merely stating that all body tissues smelt of alcohol. The pathological diagnosis was coronary sclerosis, myocarditis and acute alcoholic gastritis. Microscopically, the liver showed marked fatty degeneration and congestion. In the second, 9 hours post mortem, a qualitative test for ethyl alcohol in the stomach contents was strongly positive. The stomach was filled with coffee-ground material, its blood vessels were dilated, and there was hypertrophy of the pylorus, oedema of the brain and atherosclerosis. On microscopic examination there was only slight parenchymatous degeneration of the liver. Post-mortem examination in the third case was made 5 hours after death. Blood from the heart showed a content of alcohol of 0.178 mgm. % by volume, a concentration which is suggestive of intoxication and which does not indicate alcoholic coma. Examination of the other organs, including the brain, showed only one positive finding, namely, the presence in the left bronchus of stomach contents. Microscopically in the liver there was only slight degeneration around the central veins. All three cases were in men and all showed a diffuse necrosis of the pancreas with only small islands of normal parenchyma left. There was little haemorrhage and no inflammatory cellular infiltration. The lesions thus resembled a marked acceleration of post-mortem autolysis.

Methyl alcohol poisoning.—The patient was a middle-aged woman who was known to have been drinking lemon oil. She was seen by her physician shortly before death with symptoms suggestive of methyl alcohol poisoning, including severe vomiting. Autopsy was performed 17 hours post mortem elsewhere, but a sample of blood from the heart, the whole stomach, and portions of liver, pancreas and heart were sent

* From the Bureau of Laboratories, Province of New Brunswick, Saint John, N.B.





to me, the latter three fixed in formaldehyde. Scrapings from the surface of the stomach gave a negative qualitative test for ethyl alcohol and a strongly positive test for methyl alcohol. The concentration of methyl alcohol in the blood was 0.091 mgm. % by volume. The prosecutor described no gross lesions except moderate congestion of the abdominal viscera, a very soft omentum, and the abdominal fat deep yellow and waxy in consistency. Microscopically, the pancreas showed marked necrosis and the liver only slight parenchymatous degeneration.

Arsenic poisoning.—A woman of 35 had been treated 8 months before death for a tumour of the breast by the application of an arsenious acid paste to the skin of the right breast over a period of two or three months. Treatment was said to have been successful at that time, but further trouble appeared two or three months before death and she again had applications of an arsenical paste for a period of about a month before death. Five days before death she was stated to be in a rundown condition and for four days had drunk an enormous amount of water and complained of a "hard feeling" in the stomach, but had no great pain. She finally "slipped away quietly".

Autopsy was performed by me 12 hours later. The right breast was small and the skin covering it over an area the size of the palm of the hand was dark purplish-black, and parchment like. No nipple was seen. The axillary nodes were not enlarged and section of the breast showed a dense, diffuse fibrosis, and no evidence of carcinoma. This was substantiated microscopically. The most prominent gross lesion in the other organs, including the brain, was in the pancreas, which showed haemorrhage on the surface and was large, soft and pale, with smaller haemorrhages in the substance of the organ on section. It looked rather like a banana. Microscopically, there were extensive areas of necrosis with some haemorrhage, but no cellular infiltration. The kidneys and liver showed only moderate degeneration. Quantitative arsenic estimation by the Gutzeit method in mgm. per kilo. of wet tissue showed 10.5 in the kidney,

over 18 in the right breast, 40 in the pancreas, and 15 in the liver.

I have studied two other cases of arsenic poisoning in which the pancreas was not involved.

COMMENT

The most common poisons encountered in human pathological states, namely ethyl alcohol, methyl alcohol, and arsenic, sometimes cause a very marked necrosis of the pancreas, a lesion which may cause death or at least may be a con-

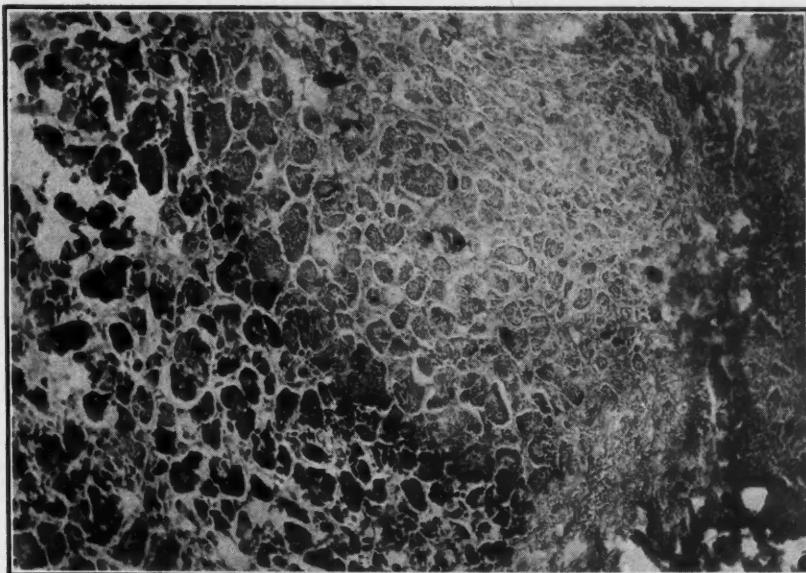


Fig. 1.—Microphotograph of pancreas (high power) showing the large areas of necrosis in the arsenic case.

tributory cause. This observation does not appear to be mentioned or stressed in textbooks of Legal Medicine and Toxicology⁴ although acute pancreatitis is mentioned as a cause of sudden death. It is thus incumbent on medical examiners to observe and section the pancreas as frequently and carefully as they do the other parenchymatous organs. The lesion resembles that of an accelerated autolysis, but the fact that there may be symptoms of an acute pancreatitis before death in alcoholism and laparotomy has been performed for this diagnosis makes it likely that the condition starts during life. Whether the action is a direct one, the poison being carried in the blood to the pancreas, is not certain, but in the case of the arsenic case reported above where the arsenic was administered by the skin and where there was no demonstrable gastro-duodenitis or disease of the gall bladder and ducts this would seem to be the likeliest explanation. The other possibility is that pancreatic juice is forced into

the tissue spaces by an obstruction of the gut by spasm or inflammation of the ampulla. In whatever way the lesion is initiated it is undoubtedly accelerated by escape of pancreatic enzymes later.

Acute pancreatic necrosis is also found on occasion at autopsy in cases in which none of the above-mentioned poisons are suspected.

NOTE.—Since writing the above I have seen three other cases of sudden death in which ethyl alcohol was directly or indirectly implicated. The first, a man of fifty-four, a chronic alcoholic, died in an acute debauch with 0.33% alcohol in the blood. The liver showed marked fatty degeneration and in the pancreas there were only occasional areas of focal necrosis. The second, a man of fifty, died of a fractured skull from a fall downstairs while intoxicated. The blood alcohol was 0.28% and there were no lesions in the pancreas. The third, a woman of 51, had an alcoholic content of 0.33% and showed widespread haemorrhagic necrosis of the pancreas.

One wonders whether the dietary absence of essential amino acids which is accepted as causing fatty livers and cortical necrosis in the kidney is not the factor involved in the pancreatic necrosis of chronic poisonings.

REFERENCES

1. ARCHIBALD, E. A.: Nelson's Loose Leaf Medicine, Vol. 5, p. 545.
2. WEINER, H. A. AND TENNANT, R.: *Am. J. M. Sc.*, 1938, 196: 167.
3. CLARK, E.: *Am. J. Path.*, 1940, 164: 689.
4. WEBSTER, R. W.: Legal Medicine and Toxicology, Saunders, Phila., 1930.
5. GLAISTER, J.: Textbook of Medical Jurisprudence and Toxicology, Livingstone, Edin., 1931.
6. GONZALES, T. A. *et al.*: Legal Medicine and Toxicology, Appleton-Century, N.Y., 1937.
7. McNALLY, W. D.: Medical Jurisprudence and Toxicology, Saunders, Phila., 1939.

INVEST IN VICTORY. In 1943, over 2½ billions of dollars were realized through the sale of Canada's Victory Bonds. Citizens dug deeply but when the year ended they still had more money on deposit in the banks than before. The objective of the 7th Loan is \$1.3 billions. Let's go well over the top.



FRACTURES OF THE WRIST AND HAND*

By Surg.-Commander H. S. Morton, R.C.N.V.R.
Esquimalt, B.C.

THE hand is an outward and visible form distinguishing man from the lower animals, and carrying out the ideas of the human mind. It performs a great variety of delicate movements with considerable intrinsic strength. For this reason accurate restoration of the architecture of this member after injury is important, and merits careful attention to detail by the surgeon.

Fractures in this region are more common in the services than in civil practice because of the greater exposure to injury, and are more often detected because of the routine use of radiographs.

The cause of fracture of the scaphoid is usually a fall, and it results in disability, pain, limitation of movement and loss of power. The diagnosis may be elicited by tenderness in the anatomical snuff-box, but the final diagnosis rests on the radiogram. Another factor is the age group; in older individuals such an injury results in a Colles' fracture rather than a fractured scaphoid. One of the cases in this series, however, had both a fractured scaphoid and a Colles' in the same wrist, while another had a bilateral scaphoid.

Treatment consists of immobilization in a plaster cast for about three months, and Watson-Jones recommends continuation of this up to eighteen months if necessary to obtain union. A period longer than three months, however, becomes uneconomical especially in the services due to the law of diminishing returns. At this point, if no evidence of union is seen, we advise and carry out bone grafting, in preference to drilling or removal, when no arthritis is present. Drilling must be considered an operation and requires a further period of immobilization as does bone grafting; but the results of grafting are much more reliable.

Excision of either the whole or a portion of this bone is a confession of failure and the results are not gratifying, as there is usually residual pain and loss of power.

* Read at the Seventy-fifth Annual Meeting of the Canadian Medical Association, Section of Surgery, Toronto, Ont., May 24, 1944.

TECHNIQUE

The technique recommended is that of Murray. Using a $\frac{1}{4}$ -inch diameter drill and with meticulous measurement bone grafting is performed with an incision through the anatomical snuff-box, thus eliminating a second incision on the dorsum of the wrist. The cast is applied on the skin without padding and maintained with radiographic control, for two to four months. On the average, bony union in the nine cases here was obtained in just under three months (Fig. 4).

TABLE I.
FRACTURED SCAPHOID

	Cured	Other procedure	%
Immobilization cast.....	24	20	83.3
Drilled, old cases.....	2	0	0
Bone grafted {old.....	6	5	—
recent.....	4	4	90.0
Total.....	29		
Partial excision.....	1		
Refused operation—10 years' duration.....	1		
Arthritis.....	1		
Total.....	32		

Passing distally to the metacarpals, their frequency of fracture is found to be even greater. It was not unusual to have in adjacent beds a fractured hand and a fractured jaw, both patients amazingly friendly, in spite of their previous contact!

The diagnosis is comparatively easy clinically, but, alas, the patients present themselves three or even six weeks after injury with a sore hand due to a mal-uniting fracture. Here again the x-ray serves to confirm the diagnosis.

TREATMENT

The principles of treatment are more conveniently considered under two headings, reduction and fixation.

1. *Reduction.*—(a) In recent cases, traction and manual pressure are sufficient. Another method of traction for reduction is the use of "Chinese basket" which may be applied to one or all of the digits, as required, and up to 30 lb. pull may be obtained quite readily (Fig. 1).

(b) The second method of reduction was devised by Jahss. He recommended flexion of the metacarpo-phalangeal joint with pressure on the proximal phalanx; but this is only of

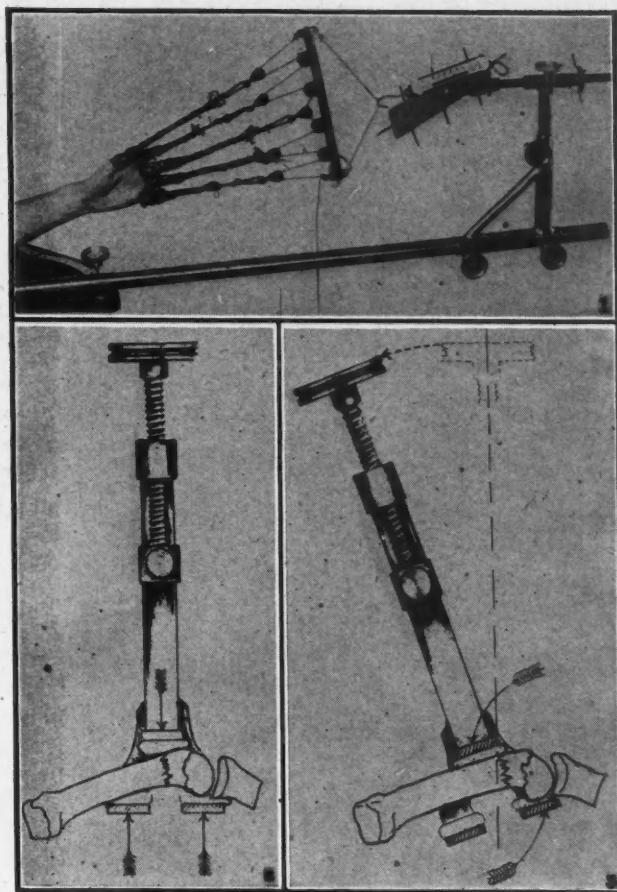


Fig. 1.—Traction on digits by means of "Chinese basket". Fig. 2.—Reduction by means of padded femur clamp. Fig. 3.—Femur clamp method—reduction by leverage.

value in recent fractures. The method I devised in 1940 is the use of a padded femur clamp as a Thomas wrench. There are two ways of applying this. As the deformity is almost invariably dorsal angulation, the clamp is applied with the two prongs on the palmar aspect and the single prong directly over the apex of the deformity. The screw is tightened until the alignment of the bones is corrected and then immediately released so as not to damage the soft tissues. If this is not completely satisfactory, then by swinging the handle of the clamp towards the forearm, leverage is obtained, and fractures up to six weeks old can be corrected by this method (Figs. 2 and 3).

2. *Fixation.*—The usual method of fixation is plaster of Paris, which may be moulded to the contour desired and should include the joints above and below.

Traction may be used as a form of fixation by means of the banjo splint and its numerous modifications. A Surgeon-Commander in the Royal Navy has a special, small Thomas splint



Fig. 4.—Bone graft of a fractured scaphoid showing union.
 Fig. 5.—Banjo-splint on first metacarpal.
 Fig. 6.—Roger Anderson fixation on first metacarpal.

for the thumb, little finger, etc., Hawley has a special wire finger frame for one or more fingers. A coat-hanger incorporated in the plaster is commonly used, while traction may be applied through the pulp, finger nail or skeletally. There is, however, an objection to prolonged fixation and traction, and that is that the fingers become stiff, and this is even more marked in the phalanges (Fig. 5).

To avoid this, pins may be used either transversely or longitudinally. Small pins with a

transverse pinning, the pins can be used for reduction before they are finally secured.

Fractures of the phalanges are common and are even more difficult to treat than metacarpals because of their size and the need for early movement. The principles of treatment remain the same, but accuracy of apposition is even more essential. The phalanges seem to take longer to unite, so that prolonged traction is undesirable. Manual reduction and immobilization over a roller bandage is usually suf-

screw thread, the size of a large Kirschner wire but only two or three inches long, may be inserted through the skin, the head of the bone, and may be prolonged into the next bone, using the adjacent metacarpal as an internal splint. If one pin is not considered sufficient to hold the fragments in position, two may be used, and to make the job even more complete, I prefer to fix the two ends, protruding through the skin, with a small bar. This gives a *trapezium* fixation, using the adjacent metacarpal as the fourth side of the geometrical figure. Early movement, full use and consequently quick union should be obtained by means of this method. In fact, it is difficult to imagine more solid fixation (Fig. 7).

Of course, a full Roger-Ander-son, or Stader splint, may be used with three or four pins, but this is usually unnecessary in single bones and should be reserved for the more serious multiple or compound fractures (Fig. 6).

The last method of pinning, recently developed in Toronto, is the intra-medullary, through the head along the length of the bone. The objection to this type of pinning is injury to the joint surfaces, and difficulty of application, because it should only be done after perfect reduction, whereas in the other methods of

ficient for simple cases. If complete reduction cannot be maintained in this way then longitudinal pinning becomes the method of choice because lateral pinning is too cumbersome, interfering with the movement of the other fingers. In recent compound fractures with marked deformity it is quite easy to insert an intra-medullary wire, especially in the shaft. Then movement becomes possible and as much as 50% can be obtained in two weeks, that is, as soon as the wound is healed (Figs. 8 and 9).

For non-union or even delayed union, bone-grafting is efficacious although it must be remembered that jewellers' accuracy is a proviso.

In these cases early exercise is imperative to prevent adhesions and the loss of fine movements, and to this end the early and continuous co-operation of the patient is essential.

CONCLUSION

Injuries to the wrist should be radiographed routinely; otherwise fractures of the scaphoid and cracks of the metacarpals and phalanges will be missed. If the scaphoid has not united after three months' immobilization in plaster, a $\frac{1}{4}$ -inch diameter bone-graft is advisable unless arthritis is present. The results of this method have been satisfactory because all the cases are back at work with satisfactory wrists except two, one of which had arthritis, while the other, of about 1 year's duration, failed to unite in spite of both drilling and bone-grafting. Most of the services in Canada and the United States board out cases of non-union, whereas 90% of our cases of non-union followed by early bone-graft are useful both to themselves and to the service.

In the treatment of metacarpals, two new methods are described: (1) the use of the femur

bone clamp for reduction; (2) the trapezium method of fixation by transverse pins.

For the phalanges careful reduction and early movement are invaluable, and to obtain this longitudinal pinning is of assistance.

SUMMARY

1. Thirty-two cases of fractured scaphoid are reviewed.

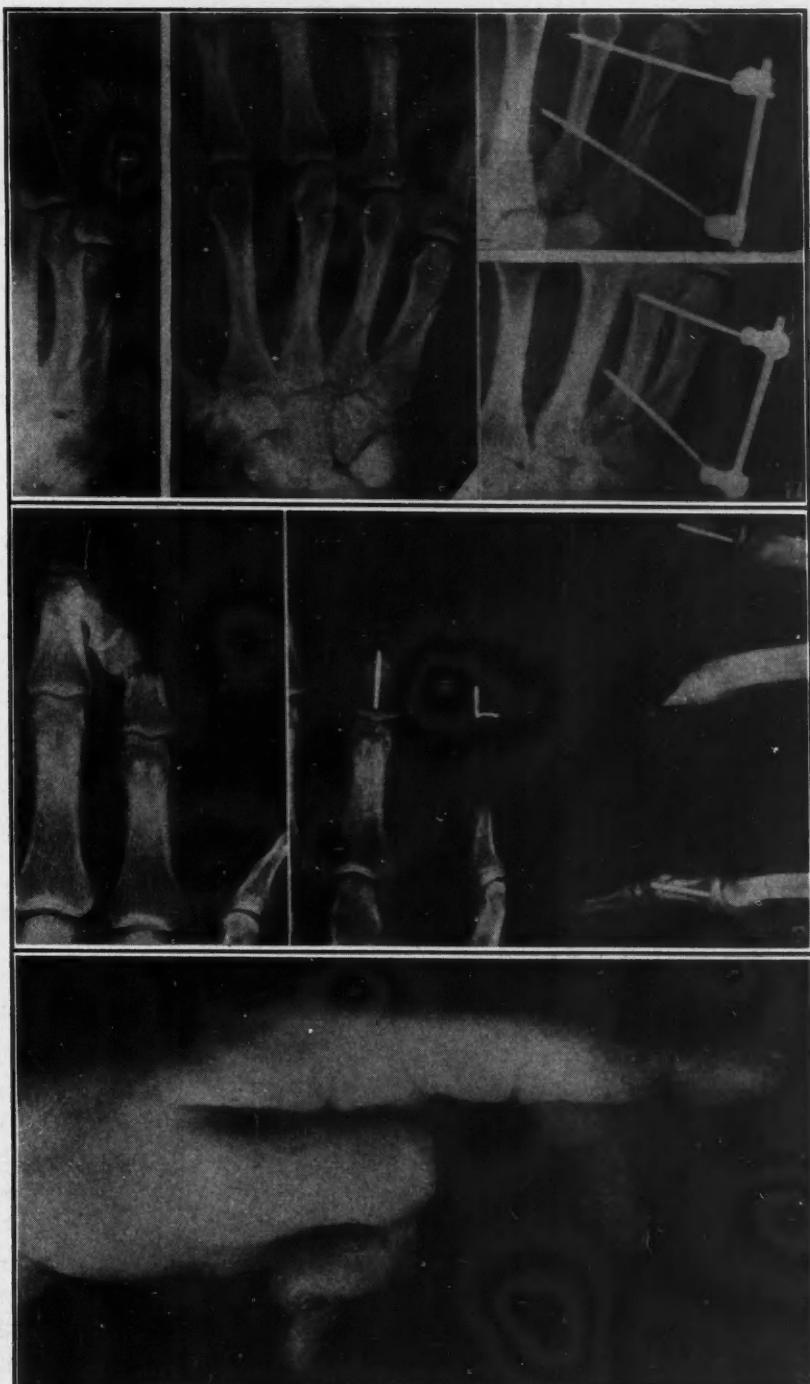


Fig. 7.—“Trapezium” fixation of fifth metacarpal.

Fig. 8.—Intra-medullary pin in compound fracture of middle phalanx.

Fig. 9.—Movement of compound fracture two weeks after injury.

TABLE II.
FRACTURED SCAPHOID

1.	W.W.	A.B.	19	Fall	R	Cast	3 months	Firm	
2.	W.A.	Sto.	32	Fall	R	Drilled and partial excision	....	Non-union	18 months' duration
3.	A.F.	O/S	18	Fall	R	Cast	3 months	Firm	
4.	J.J.	A.B.	26	Fall	L	Graft	3 months	Firm	
5.	W.J.	O.A.	28	Fall	R	Graft	3 months	Firm	
6.	B.C.	Sto.	20	Fight	R	Cast	3 months	Firm	
7.	E.C.	O/S	21	Fight	L	Graft	3 months	Firm	
8.	A.B.	C.P.O.	26	Fall	R	Graft	3 months	Firm	
9.	J.K.	L/Sea.	25	Fall	L	Cast	3 months	Firm	
10.	G.M.	O/S	26	Fall	R	Drill and graft	3 months	Partial	18 months' duration
11.	R.M.	A.B.	21	Fall	L	Graft	3 months	Firm	2 years' duration
12.	R.N.	Stwd.	24	Boxing	R	Graft	3 months	Firm	1 year's duration
13.	J.Q.	O/S	26	Fall	L	Graft	3 months	Firm	Cystic degeneration
14.	T.S.	Sto.	21	Fall	R	Cast	3 months	Firm	
15.	F.P.	O/S	22	Fall	R	Cast	3 months	Firm	
16.	I.M.	S.B.A.	19	Fall	L	Cast	4 months	Firm	
17.	S.S.	Sto.	25		R	Graft	3 months	Firm	
18.	G.W.	C/S	30	Baseball	L	No treatment	....		3 years' old
19.	P.M.	O/S	23	Fall	R and L	Cast	3 months	Firm	10 years' old
20.	N.P.	P.O.	28	Fall		Cast	3 months	Firm	Bilateral
21.	J.J.	Gnr.	22	Fall	L	Cast	3 months	Firm	
22.	T.M.	O/S	24	Fall	R	Cast	3 months	Firm	
23.	D.R.	S.B.A.	19	Fall	L	Cast	4 months	Firm	
24.	H.P.	Sto.	28	Fall	R	Cast	3 months	Firm	
25.	L.C.	O/S	24	Fall	L	Cast	3 months	Firm	
26.	R.B.	O/S	24	Fall	R	Cast	3 months	Firm	
27.	J.M.	Elect.	22	Fall	R	Cast	3 months	Firm	
28.	T.B.	O/A	23	Fight	R	Cast	3 months	Firm	
29.	D.M.	Wren.	23	Fall	R	Cast	2 months	Firm	
30.	G.C.	Sto.	25	Fight	L	Cast	3 months	Firm	
31.	J.M.	O/S	26	Fight	R	Graft	3 months	Firm	

2. Ten of these have been bone-grafted for non-union and delayed union, nine with good results.

3. Accurate measurement is essential and by this means a second incision may be avoided.

4. A method of reducing late fractures of metacarpals is introduced.

5. A new method of fixation of metacarpals is described.

6. An intra-medullary wire pin has been used with success in recent compound fractures of the phalanges.

velles incisions. On décrit deux nouvelles méthodes thérapeutiques: la première, pour réduire les fractures anciennes des métacarpiens, et la seconde, pour assurer la fixation des métacarpiens; il s'agit alors de maintenir la coaptation par l'emploi de clous enfouis perpendiculairement au grand axe de la phalange jusque dans la moelle osseuse.

Jean Saucier

NON-MALIGNANT DUODENO-COLONIC FISTULA

By James B. McClinton, M.B., B.Sc.Med.

Timmins, Ont.

BENIGN duodeno-colonic fistulæ are extraordinarily rare.

A man, aged 47, complained of "an ulcer". He said he had had a duodenal ulcer for several years and had been x-rayed. He was suffering indefinite abdominal pain. The x-ray report was investigated and confirmed his story. The patient was now treated with bed rest, frequent feedings, abstention from tobacco, and alkalis. He returned in a few days stating that his pain was better, but the "other trouble was worse". "What other trouble?" He said "diarrhoea".

The diarrhoea came immediately after meals. If he was lying down it came a half hour after

BIBLIOGRAPHY

1. HAWLEY: Quoted by Scudder, Treatment of Fractures, 11th Ed., 1939.
2. JAHSS, S. A.: *J. Bone & Joint Surg.*, 1938, 20: 178.
3. JOLDERSMA, R. D.: Personal communication.
4. MURRAY, G.: *Brit. J. Surg.*, 1937, 19: 1099.
5. *Idem*: *Canad. M. Ass. J.*, 1943, 49: 173.
6. NORMAN, H.: *Canad. M. Ass. J.*, 1943, 49: 490.
7. WATSON-JONES, R.: Fractures and Other Bone and Joint Injuries, Livingstone, Edinburgh, 1940, p. 413.
8. WAUGH, R. L. AND FERRAZZANO, G. P.: *Am. J. Surg.*, 1943, 59: 186.
9. WHEELER, I.: *The Lancet*, 1940, 2: 546.
10. YOERGER, R.: Personal communication.
11. ANDERSON, R.: *J. Internat. Coll. Surgeons*, 1942, 5: 458.
12. SHAAR, C. M. AND KREUZ, F. P.: *Surg. Clin. N. Am.*, 1942, 22: 1537.

RÉSUMÉ

On rapporte 32 cas de fractures du scaphoïde dont 10 furent traités par la greffe osseuse. Ces greffes furent faites parce que l'union des fragments fracturés ne se faisait pas ou tardait à s'accomplir; neuf de ces greffes furent réussies. Il est essentiel que des mesurations précises soient faites afin d'éviter de nou-

food. The faeces were foul smelling and contained undigested food.

A further gastric series was carried out and Dr. R. W. McBain, St. Mary's Hospital, Timmins, confirmed the presence of a duodenal ulcer, with much irregularity of the cap, searing, some obstruction, and a pool of barium near the second portion of the duodenum. It did not reveal fistula.

The diarrhoea was not relieved by varied foods, nor by moderate doses of opium.

A barium enema then revealed a fistula between the transverse colon and the duodenum.

into the colon a Miller-Abbott tube was inserted. It passed the fistula and normally entered the small bowel. Five thousand calories of fluid were introduced each day. The diarrhoea did not improve. Apparently, hydrochloric acid from the empty stomach was trickling into the colon. Heavy doses of opium stopped the diarrhoea but the patient became distended, vomited faecal matter, and was losing weight. It was decided to remove the tubes, to administer laxatives, enemas, intravenous fluids, and to temporize no further.

Sodium sulfasuxidine was administered dur-



Fig. 1

Fig. 1.—Barium enema. Barium enters duodenum from colon. Duodeno-colonic fistula.
Fig. 2.—Colon. Apparently normal. One month after operation for duodeno-colonic fistula.

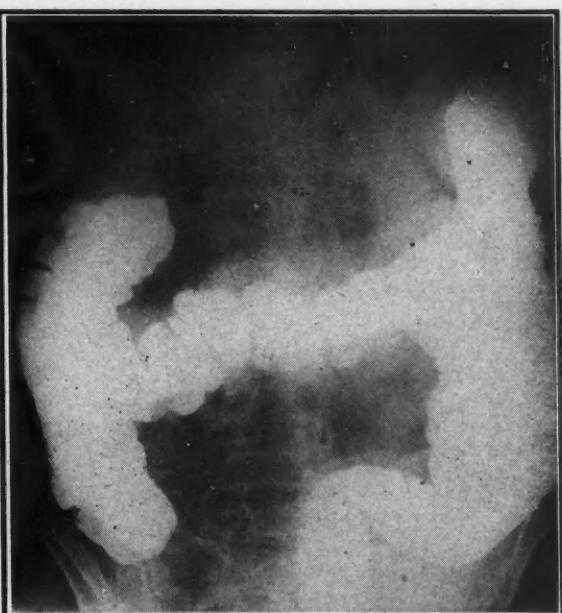


Fig. 2

Dr. McBain reported that the barium was in the stomach two minutes after introducing it by rectum.

In hospital the patient admitted that the diarrhoea dated from an illness two years before, when in the bush he had suffered a sudden pain in the pit of his stomach. He said "it struck me and I struck the ground at the same time". It took two days to transfer him by sleigh to hospital. He was quite ill. He obviously survived a ruptured duodenal ulcer without operation.

On admission to hospital his weight was 119. He had lost 30 lb. in 24 months. I hoped to obtain a stationary or increasing weight curve before operation.

Since the radiologist was of the opinion that one-third of the food was being side-tracked

ing the preoperative twenty-four hours. The manufacturers claim that this product, not quickly absorbed, will "almost produce a sterile stool". If so, it is obviously indicated in colonic procedures.

Under general anaesthesia I explored the abdomen. Massive adhesions presented. The transverse colon was adherent to the duodenum around the fistula and the gall bladder. The adhesions were separated. The fistula was recognized. It lay between the transverse colon and the duodenum, 2½ inches below the pylorus. It was clamped, incised, and each opening inverted with a purse-string suture. The channel was as wide as a thumb.

Recovery was uneventful. The patient's weight in six months was 165 lb. and he was doing heavy work.

X-ray photographs of barium enemata, showing the original fistula and an apparently normal colon after operation, are shown.

I can only find reports of four cases of benign duodeno-colonic fistula from 1885. They were reviewed by McPeak in 1940.¹ One case was diagnosed presumptively and died. A second was discovered at operation and lived. Two others were diagnosed by barium enema, and one lived. None were diagnosed by gastric series. All cases followed ruptured duodenal ulcer without operation.

The effect of stomach secretions on the colon was baffling. It appeared that hydrochloric acid trickling down was irritating to the colon.

On the writer's suggestion, Dr. D. W. Gordon Murray, of the Toronto General Hospital, conducted experiments on colostomy cases by injecting dilute hydrochloric acid. He states as follows:

"Since your suggestion regarding the effect of hydrochloric acid on the colon, I have had four colostomies in whom we tried injecting a dilute solution of HCl. It is my impression from this experience, that the HCl produces hyperperistalsis with secretion of mucus. In two, after going on for ten days or more, there was some blood in the mucus suggesting a rather active colitis as a result of the acid."

CONCLUSIONS

Benign duodeno-colonic fistulae are rare. They follow ruptured duodenal ulcer without operation. They are only diagnosed by a barium enema and must be treated operatively.

Slowly absorbing sulfa drugs, like sodium sulfasuxidine, may well be administered in surgical colonic procedures.

This is believed to be the fifth case reported in the literature since 1885.

REFERENCES

1. MCPeAK, C. N.: Benign duodeno-colic fistula, *Radiology*, 1940, 34: 343.
2. MURRAY, D. W. G.: Personal communication.

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WILSON'S DISEASE*

By Rudolf Altschul and J. S. Brown

Saskatoon

THE usual conception of the morbid anatomy of Wilson's disease is that of a degeneration, affecting the liver and the lenticular nucleus, the changes being restricted to these two organs; hence the alternative term hepato-lenticular degeneration. The familial nature of this condition and the essential clinical symptoms—rigidity, tremor and emotionalism—are all well illustrated in a family consisting of four brothers and a sister which has already been described.¹ But the pathological findings differ very considerably from the classical description indicated above.

As shown in the table below the disease has affected all the boys of the family and all four have died from this disease while the one girl, the oldest of the family, has been unaffected. The case of the oldest brother, Francis, was discussed by D. M. Baltzan² and the other three by us.¹ At the time of the second publication, the third boy Charles, though showing the characteristic clinical picture, was still alive. There were clinical signs of Parkinsonism in the three older brothers. Their lack in the youngest appeared to be due to the unusual rapidity of the disease, and we believe that his early death alone prevented the development of neurological symptoms. The cerebral changes were slight in the second and fourth boys, but the brain of the oldest boy showed an extensive malacia of the frontal and temporal regions.

Unusual features of two of the cases were a clinically manifest tetany in the oldest brother and in the second brother an endarteritis obliterans and fatty atrophy in the parathyroid gland. These changes were reported in the previous articles.

The case to be described here, Charles, was examined by us¹ clinically in April and August,

* From the School of Medical Sciences, University of Saskatchewan, Saskatoon.

TABLE

Father aged 61, healthy.	Mother died suddenly from "stroke" in 1942, aged 55, with no mani- fest signs of Wilson's disease.
Daughter. 29, healthy.	Francis, died 1935, at 17. Duration of dis- ease: 2 years.
	John. died 1940, at 17. Duration of dis- ease: 4 years.
	Charles. died 1943, at 18. Duration of dis- ease: 4 years.
	Garth, died 1938, at 9. Duration of dis- ease: 3 months.

1941. Shortly after the second examination, the patient left the city and died in June, 1943, in an old people's home. No exact record describing the course of the disease between August, 1941, and his death was available. Through the courtesy of Dr. F. C. Heal and Dr. T. M. Leask, of Moose Jaw, we were able to examine some of the organs.

The microscopical examination of the kidneys, heart, suprarenals and pineal gland showed no pathological changes.

The brain weighed 1,255 gm. It showed no alterations of its surface, but upon cutting coronal sections a softening of the subcortical area was found in the right frontal lobe, corresponding to the posterior half of the superior frontal gyrus. No other macroscopical changes were observed. Histological investigation revealed that the cortex of the right frontal gyrus contained in its posterior portion many newly-formed vessels with comparatively thick walls. The cyto-architecture of this area was greatly disturbed, partly by the ingrowth of these vessels, partly by shrinkage of the oedematous gray substance. There was no primary alteration of the nerve cells and neuroglia. The subjacent white substance showed a marked loosening of its texture (*status spongiosus* with very coarse meshes). Neither the histiocytes or blood cells nor the vascular system showed any reaction to these alterations.

As in the cases of the second and fourth brothers, the basal ganglia showed few microscopical changes. In the left putamen the neuroglia cells were increased in number, but sections showed neither the bizarre glia forms of pseudosclerosis nor the necrotic alterations of the classical Wilson cases. In both lenticular nuclei, adjacent to the internal capsule and in the internal capsule proper, a *status spongiosus* was noticed, resulting probably from an intravital oedema.

In both cerebellar hemispheres a softening was found both outside and inside the dentate nuclei, involving the white substance surrounding these structures. The blood vessels of these areas were enlarged, the white substance spongy and penetrated by numerous lymphocytes and histiocytes. The grey lamina of the dentate nuclei was not directly affected. No histological changes of the medulla oblongata could be seen, either in a cell stain or in a Weigert-Pal preparation.

The liver weighed 688 gm., and had the classical hobnail appearance. Microscopically, the typical features of a portal biliary cirrhosis were seen, with intralobular necrotic areas. But the nuclear alterations (swelling and bursting of liver cell nuclei) as described by Baltzan in the liver of the oldest brother and found again in the liver of the second brother, were absent.

The thyroid gland was not enlarged, but many follicles were in-

creased in size, greatly exceeding the average size of normal follicles (163μ , J. L. Jackson⁴), reaching even up to 600μ diameter. The follicular epithelium was very flat and the follicles distended with colloid. In some places poorly developed follicles were found with darkly staining small epithelial cells and with very small cavities. In other places cell nests without cavities were seen.

It seems not unreasonable to suppose that these cellular masses had been recently developed to supplement the apparently insufficient function of the old distended follicles. The amount of interfollicular connective tissue was increased to a certain degree and the term fibrosis of the thyroid gland may be adequate. In one artery a subendothelial lesion was ob-

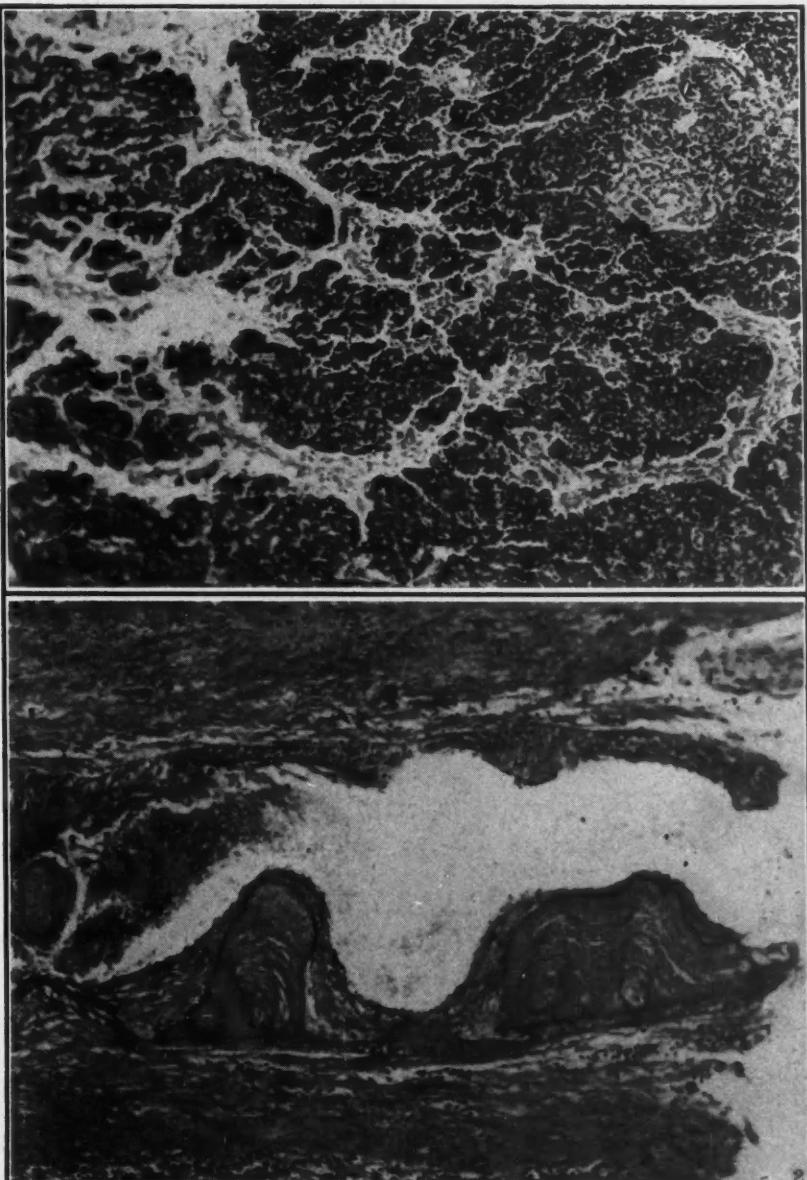


Fig. 1.—Parathyroid. H&E. Diameter 52x. Strands of connective tissue subdivide the gland into irregular lobules.

Fig. 2.—Artery of the spleen (longitudinal section). H&E. Diameter 110x. Note the protrusion into the lumen of two large and one small "cushions" of unknown nature.

served similar to, or identical with, the vascular changes which will be described later.

Much attention was paid to the parathyroids. Three of them were examined thoroughly. In all three the interior showed an overgrowth of connective tissue, varying slightly in intensity in the different glands and in different portions of the same gland. It is hard to say what should be considered an increase in the amount of connective tissue. But, after comparing the slides with normal organs, there would appear to be a definite overgrowth. The strands of connective tissue tended to cut off areas of parenchyma, forming lobules of irregular size (Fig. 1). The parenchyma consisted mostly of pale cells and few eosinophilic epithelial cells. In one of the glands some of the normally occurring follicles were greatly enlarged and formed small epithelial cysts filled with a slightly basophilic colloid.

But the outstanding alteration found in the parathyroids was a peculiar change in the walls of the small intraglandular vessels. This alteration was also seen in the wall of a large splenic artery and in a thyroid artery, where its structure and location appeared much clearer, owing to the greater size of the vessels. The same or a similar alteration was found in the endoneurium of a medium sized peripheral nerve from the neck region which was sectioned when the parathyroids were searched.

As seen from Fig. 2, the alteration was a patchy, acellular swelling of the subendothelial tissue of the intima, protruding into the lumen and displacing the muscular elements of the media or causing their atrophy. The substance was lamellated and stained pale blue in the standard haematoxylin stain. Naturally, we tried to identify it by its histochemical reactions. Its basophilia excluded hyalin. The methyl violet and iodine reactions were negative for amyloid and the silver nitrate reaction of Kossa for calcium was also negative. The iron reaction gave a negative result. With mucicarmine a very slightly positive reaction was obtained, but we would hesitate to accept this as proof for mucoid degeneration. It is clear that the possibility of an artefact had to be excluded. None of the hitherto known artefacts could be identified with this tissue change. Therefore for the present we have to leave undecided the identification of this peculiar change of the vessel wall and the same or similar change of the endoneurial connective tissue.

DISCUSSION

It is well recognized that Wilson's disease may involve other parts of the brain besides the lenticular nuclei. Recently, Fracassi³ denounced the term hepato-lenticular degeneration as too narrow and proposed its replacement by the name "neurohepatic" degeneration. But several years earlier, Baltzan too had abandoned the term "hepato-lenticular" and had replaced it by "hepato-cerebral", which seems to us the better of the two proposals. In our previous report we believe we showed that not only liver and brain may be involved in the hepato-lenticular degeneration but also the parathyroid gland, and probably the anterior lobe of the pituitary. In the present case the extension of the morbid process to the parathyroid glands was again confirmed and moreover a peculiar

change was observed in some arteries of the parathyroids, the spleen and the thyroid gland and in the connective tissue of a peripheral nerve.

We do not claim to have exhausted this study since we were unable to secure for examination the pituitary, the testes and some other organs. In view of our findings we would hesitate to suggest the replacement of the term hepato-lenticular degeneration by another term, which, in our cases at least, would have to include the parathyroids and possibly other organs as well. On the other hand, we agree that it is advisable to abandon the now insufficient adjective "hepato-lenticular". We believe that for the immediate future the term Wilson's disease might be accepted as adequate, with the understanding that it comprises a combination of morbid features of which familial distribution, liver cirrhosis and brain alterations are, perhaps, the foremost, but not the only ones.

SUMMARY

A case of Wilson's disease, which affected all of the male offspring of a family, is considered and a histological description of some of the organs of the body is given. There was a pronounced liver cirrhosis; a softening in the right frontal lobe and around both cerebellar dentate nuclei and an oedema around the lenticular nucleus and in the internal capsule. The parathyroids and the thyroid showed fibrosis. Peculiar changes were found in the walls of some arteries and in the connective tissue of a nerve. The nature of these alterations could not be established.

The inadequacy of the term "hepato-lenticular degeneration" for Wilson's disease is discussed.

Dean W. S. Lindsay helped kindly with the manuscript.

REFERENCES

1. ALTSCHUL, R. AND BROWN, J. S.: Parathyroid insufficiency in Wilson's disease, *Canad. M. Ass. J.*, 1942, 46: 237.
2. BALTZAN, D. M.: A hepato-cerebral syndrome, *Canad. M. Ass. J.*, 1936, 34: 544.
3. FRACASSI, T.: Neurohepatic degeneration. Abstract in: *J. Am. M. Ass.*, 1944, 124: 130.
4. JACKSON, J. L.: The shape and size of the human thyroid follicle in health and disease, *Anat. Rec.*, 1931, 48: 219.



THE SCOPE OF INDUSTRIAL MEDICINE AND HYGIENE*

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ESTIMATES of the aggregate cost of the care of sickness and accident in Canada are arresting, but this is only one phase of the economic cost of ill-health. It has been estimated¹ that industry loses the equivalent of one and one-half times wages for each day's absence, while the workman loses his wages also. For manufacturing industry this represents well over one hundred million dollars a year for sickness absence. Canada is an important industrial country, with manufactured products worth as much as her agricultural products. In the industrial sections, a large part of medical practice concerns those associated with industry and commerce, so that the family physician and those in special practice must constantly appraise the occupational factor in diagnosis and treatment. The employer and certainly the patient are gratified at evidence of the physician's appreciation of the physical and mental requirements of their work.

The industrial physician is confronted with the control of sickness and accident due to employment; sickness in which occupation is a factor; and ordinary sickness and accident to which all are subject.

INDUSTRIAL DISABILITY

The occupational diseases account for about 1% of the cost of Workmen's Compensation for accidents. This does not represent their importance, for those industries affected by silicosis, lead or benzol poisoning may have heavy costs in compensation and for prevention. The amount of ill-health not presenting symptoms and signs of frank poisoning from some of these exposures, is large. Their variety and wide distribution require constant vigilance on the part of all physicians if the significance of many vague symptoms is not to be missed, e.g., continued gastric disturbance from lead or carbon tetrachloride exposure.

Industrial accidents are responsible for about one-tenth of the lost time from work due to ordi-

nary illness, yet they constitute one of the important contacts of the physician with industry. In this country, with relatively small factories, the traumatic surgeon is rarely retained directly by industry, so that major cases are referred by the family physician or the industrial physician, whose training should leave no doubt as to what are the criteria for reference.

OCCUPATION AND GENERAL HEALTH

The occupational factor in sickness and death from certified causes is often not clear. Without minimizing the effect of conditions entirely outside industry, occupation has been described in national health insurance experience as being second in importance only to age. Existing mortality and morbidity data are inadequate, and present difficulties in interpretation. British mortality records² show an excess from peptic ulcer in sheet metal workers and in tinsmiths, but not in other skilled trades. Mortality rates for cancer are higher in rubber workers and in leather dressers. The death rate of the wives of iron and steel foundry labourers is significantly high for all causes but particularly for cancer and pneumonia. This is true also for their husbands, but the excess incidence of pneumonia in this group has been attributed to exposure to extremes of temperature associated with the job, which explanation cannot, of course, be applied to their wives.

Similarly, sickness rates among grinders, outside workers, and finishers are higher than for other occupations in the glass industry,³ both as to number of cases and duration of disability. The number of days of disability in this group because of "rheumatic" diseases is much larger than expected from other industrial experience.

One public utility⁴ for the five year period 1933 to 1937, found the highest incidence of sickness in linemen, meter readers, and repair men, compared with other male employees, with a variation of nearly 250% between the occupational groups with the lowest and highest number of absences per one thousand employees.

Comparing an office and sales group with a manufacturing group of employees⁵ in the same industry, it was noted that while the clerical and factory employees had comparable rates, the salesmen group presented higher rates for both male and female workers, the annual average number of days lost per person through sickness absence over a five year period being for sales persons 3.1 male and 5.6 female, and for factory

* This is the first of a series of articles on industrial medicine, prepared by the Committee on Industrial Medicine of the Canadian Medical Association.

workers 2.1 male and 3 female. The suggestion is that the clerical and factory workers are in contact with much the same people day after day, whereas salesmen, waitresses and others have contact with a succession of people which may cause more sickness.

THE HEALTH PROGRAM IN INDUSTRY

The kind of continued supervision of the health of these groups necessary to explain such findings and to determine the rôle of occupation in sickness, provides at the same time, medical facilities within the factory for the maintenance of health in its broadest sense. This is industrial medicine defined to include the application of personal and environmental hygienic measures.

The Committee of the American Medical Association on the subject is called the Council on Industrial Health. This Council⁶ and the Committees on Industrial Medicine of the British Medical Association⁷ and the Canadian Medical Association,⁸ have outlined in recent years the scope of the subject in relation to the practice of medicine, for the guidance of physicians. Cases requiring the systematic treatment of disease are referred to the family physician. While it is by no means always the case, where obligation for all treatment is assumed by an industry, even on a contributory basis, the constant necessity for immediate care is very apt to put the control program in second place on account of lack of staff and other financial considerations.

Industry requires healthy workmen for the best performance and in addition, has certain legal obligations to meet, such as the care of industrial accidents, rehabilitation of injured workers, the control of occupational disease and other hazards. In a recent survey⁹ in Canada there were reported 63 physicians conducting physical examinations for employment on a fee basis, *i.e.*, usually without follow-up. Many of these examinations were directed to protection of a sick benefit fund operated or supported by employees themselves. The total number of examinations for employment by all physicians, was 235,000 in 159 factories, while the number receiving both initial and periodic examinations was only 146,000. Some employers have assumed voluntarily, part of the cost of treatment of ordinary illness, or have established personnel departments which bring to light medical needs unsuspected by management

and often by employees. To deal with such activities the physician has been usually "on call" from industry as occasion arose. On the other hand there is a growing conviction that some of the problems of adult health are best met through industry.

From such considerations, to an increasing extent progressive executives are co-ordinating the health work in the factory under a physician, who, with nursing assistance, takes responsibility not only for an isolated medical incident but for an active program of health supervision which is essentially preventive in its outlook. About one-third of the employees in manufacturing industry in Canada now receive the benefit of this service, in which in 1943 there were employed 112 full-time and 229 part-time physicians and 881 registered nurses.⁹ However, these are mainly in larger factories. Sixty per cent of those employed are in factories with less than 500 workers, and when they have been similarly served, an important contribution will have been made to industrial life and to general community health. To accomplish this it is necessary that employers and employees be informed of its value, partly by closer contact of the profession with organizations of employers and employees, particularly through their local units. The National Association of Manufacturers in the United States and the Committee on Industrial Health of the United States Chambers of Commerce are informing their members of the value of health services. The former,¹⁰ after a recent survey, reports that adequate plant medical programs have reduced accident frequency by 45%, absenteeism by 30%, occupational diseases by 63%, labour turnover by 27%, and industrial compensation insurance premiums by 29%.

The variations in existing industrial health services, respecting the program and the staff employed, suggest the need for more discussion of mutual problems. This is now afforded by the recent establishment of Sections of Industrial Medicine in the Canadian Medical and Ontario Medical Associations. Groups of industrial physicians have been formed within the local medical organizations in the cities of Montreal, Hamilton, Vancouver, Winnipeg, and Toronto.

The program covers physical examination for suitable placement at work, periodic examination for early diagnosis, attendance on cases of ill-health or accident reported to the factory

dispensary, supervision of conditions of work, rehabilitation of sick and injured employees, and health education.

THE INDUSTRIAL PHYSICIAN

In implementing this program the industrial physician should ensure adequate recording of physical examination findings and their confidential nature. He should supervise first aid and emergency services. He should insist on uniform recording of absenteeism due to all types of disability. This is the main source of information on which to build the program and with which to keep the employer informed of what is being accomplished. The industrial physician should be diagnostician to the group as far as clinical acumen and limited plant facilities will allow, referring the patient who requires more than palliative treatment to his own physician. If it is recognized that specific measures for the control of health in adults are few and that at present reliance must be placed largely upon the early recognition of disease, an opportunity exists in the industrial physician's access to the group for which he is responsible. He has before him the employee's work record which is often of preclinical significance. He knows the physical and mental requirements of the job his patient has been doing and he can make adjustments in occupation; he has access to a detailed history of illness and accident and he can make frequent clinical observations on the individual and his co-workers. He can discover the 8 or 10% who are repeatedly ill or lose time, reassure those who are unnecessarily disturbed, and detect in its early stages evidence of maladjustment at home or at work. The effect of measures taken for control of environment or in collaboration with the family physician can be closely observed. The response of labour is immediate when employees are satisfied that the service is used for health purposes only. To this end the patient-physician relationship should be maintained. Medical findings must be confidential and interpreted for management in terms of the work the employee can do. The service must be convenient, of a high professional order, and conducted with human interest.

The industrial physician should be also health officer to the factory, making regular visits throughout, noting plant sanitation, occupational disease hazards, and conditions which strain physiological adaptation, as well as ac-

quainting himself with "the man at his work". In the control of industrial hazards the physician has responsibility for determining that a hazard exists, its degree, and the adequacy of control measures as shown by subsequent physical examinations and other tests, while the engineer undertakes the design, installation and maintenance of equipment for the removal of dust and fumes. This is typical of the relationships inside and outside the factory which are numerous and important to the industrial physician.

INDUSTRIAL HYGIENE DIVISIONS

Although considerable factory legislation directed to the protection of the health of wage-earners was enacted in the previous one hundred years, it remained for the investigations of the British Munition Workers' Committee¹¹ in the last war, continued by the Industrial Health Research Board, to establish the economic importance of good conditions of work. It does not follow that a workman will produce more in twelve hours than in ten, or that the lack of adequate sanitary facilities will ultimately save time. One of the most important measures for the control of industrial dermatitis, which is responsible for 80% of the cases of reported occupational disease, is the use of washing facilities. Speed of operation can defeat its purpose through an increase in the accident rate. There is more sickness among those on fixed-pace operations.¹² Education in accident and sickness prevention for the past twenty years has assisted in making employees more conscious of the importance of good conditions of work so that they now have become a factor in the "bid for labour". It is no longer considered impossible that a foundry be a clean place in which to work. Most employers want a healthy working force, although some have not reached the point where they are prepared to go beyond what is required.

Governments have recognized that it is not always sufficient to require that a condition be corrected, and that industry, particularly small factories, may not be able to secure the technical facilities necessary for investigation to detect and control many of the hazards to health. There have been widely established, therefore, in Canada and the United States, Divisions of Industrial Hygiene in Provincial or State Departments of Health, equipped to determine whether a dangerous condition exists, the degree

of exposure, the effects it has produced, and to advise what measures are necessary for its control. Studies and recommendations are made on other environmental conditions such as ventilation, lighting, noise. For this purpose, these Divisions have laboratories and staffs of physicians, chemists and engineers. More complete reporting of suspected cases of occupational disease, as required in some jurisdictions such as Ontario, would enable these Divisions to return to the practising physician, statements on the more recent exposures which might be encountered.

At the same time, it is obvious that interest in the control of hazards, on the part of factory executives and employees is much more effective than inspection or special investigations alone, so that these Divisions have encouraged employers to develop their own health supervision services, not alone for the control of occupational diseases, but again, directed to the maintenance of general health. To this end, information is available to physicians and employers on the details of the establishment and operation of a health service including accommodation required, amount and kind of staff and equipment, methods of recording, and the program to be covered. For this purpose, these Divisions employ physicians who are familiar with medical administration in industry, and nurses with public health and industrial experience, to advise medical personnel on procedure. Physicians and nurses are invited to make use of these facilities to a greater extent than at present. There are Divisions of Industrial Hygiene in the Dominion Department of Health, and the Provincial Departments of Quebec, Ontario and Manitoba.

TRAINING OF INDUSTRIAL MEDICAL PERSONNEL

The first requirement is a well-trained physician with at least two years' internship and some experience in general practice. The physician entering industry should receive postgraduate training covering a period in a factory with a suitable health service. In addition there should be lectures on the physiological response to conditions of work; relationships which exist within industry; the community facilities available for assistance in the maintenance of health such as public health nursing, tuberculosis and venereal disease control; legislation on the prevention and care of industrial disability; and,

methods of health education. Short courses of this type have been given in American universities, but not as yet in Canada. Refresher courses for physicians now in industry have been presented from time to time at Toronto and Montreal.

Since most factories are small, much of the service is on a part-time basis, and becomes a specialized function of the general practitioner. Therefore it is important that the family physician recognize the industrial physician's place in community medical effort. The industrial physician should co-operate with the family physician in providing medical history, referring patients who require systematic treatment, and assisting in rehabilitation.

Industrial nurses preferably should be trained in public health and have some field experience. Their work is an essential part of an industrial health service. It can be made to conserve the time of the physician spent at the factory, and to give effect to health teaching.

LITERATURE

There is an extensive current literature on various aspects of the subject, and a number of recent textbooks. For some years *The Journal of Industrial Hygiene and Toxicology*, with an international editorial board, has been published from Harvard University. It contains reports of research on health in industry and abstracts of English and foreign language articles. The journal entitled *Industrial Medicine* is the official organ of the American Association of Industrial Physicians and Surgeons. It records the experience in medicine and surgery in industry, and is particularly helpful to physicians conducting health supervision. *The British Journal of Industrial Medicine* published its first issue in January of this year. The International Labour Office in the period between the wars issued extensive brochures on the various occupational diseases. The Medical Committee of the Industrial Hygiene Foundation has issued a series of relevant reports. An increasing number of articles dealing with industrial health have appeared in the general medical journals. The Divisions of Industrial Hygiene have libraries with a detailed index of information published on the toxicity of industrial materials, and on the experience with the development and operation of industrial health services.

REFERENCES

1. BRUNDAGE, D. K.: An estimate of the monetary value to industry of plant medical and safety services, *U.S. Pub. Health Rep.*, 1936, August 21, 1151.
2. British Registrar-General's Decennial Report, 1931.
3. GAFAFER, W. M.: Disabling sickness among glass workers, *Pub. Health Rep.*, 1941, September 5, 1796.
4. *Idem*: Frequency and duration of disabilities causing absence from work among the employees of a public utility, 1933-1937, *U.S. Pub. Health Report*, 1938, July 29, 1284.
5. Sickness Absence and Labour Wastage. Report No. 75, Industrial Health Research Board, p. 12.
6. Medical service in industry, Council on Industrial Health, *J. Am. M. Ass.*, 1942, 118: 895.
7. Report of the Committee on Industrial Health in Factories, British Medical Association, London, England, 1941.
8. Committee on Industrial Medicine: Scope and methods of work in industrial medicine, *Canad. M. Ass. J.*, Supplement, 1942, 47: 24.
9. National Health Survey. Part VI. Industrial Medicine, conducted by the Canadian Medical Procurement and Assignment Board, Ottawa.
10. Industrial health practices. Report of a survey conducted by the National Association of Manufacturers Committee on Healthful Working Conditions, *Indust. Med.*, 1941, 10: 389.
11. Final Report Health of Munition Workers Committee, London, England, 1918.
12. TURNER, G. H.: A study of the effect of fixed-pace work upon health, *Canad. Pub. Health J.*, 1943, 34: 68.

RECENT TEXTBOOKS

LANZA, A. J. AND GOLDBERG, J. A., editors: *Industrial Hygiene*—various authors, Oxford Press, New York, Toronto and London, 1939.

SCHWARTZ, L. AND TULIPAN, L.: *Occupational Diseases of the Skin*, Lea & Febiger, Phila., 1939.

VERNON, H. M.: *Health in Relation to Occupation*, Oxford Press, New York and London, 1939.

COLLIER, H. E.: *Outlines of Industrial Medical Practice*, Arnold, London, 1940.

VERNON, H. M.: *The Health and Efficiency of Munition Workers*, Oxford Press, London, 1940.

KESSLER, H. H.: *Accidental Injuries*, Lea & Febiger, Phila., 1941.

REED, J. V. AND HARROD, A. K.: *The Essentials of Occupational Diseases*, Thomas, Springfield, Ill., 1941.

JOHNSTONE, R. T.: *Occupational Diseases*, Saunders, Phila. and London, 1942.

Symposium on Industrial Medicine, *Medical Clinics of North America*, Saunders, Phila. and London, 1942.

SAPPINGTON, C. O.: *Essentials of Industrial Health*, Lipincott, Phila. and Montreal, 1943.

Manual of Industrial Hygiene, edited by W. M. Gafafar, prepared by the Division of Industrial Hygiene, National Institute of Health, United States Public Health Service, Saunders, Phila. and London, 1943.

abdominal cavity), and was able to demonstrate that such anti-oestrogenic factors as testosterone and progesterone could inhibit the tumorigenic action of the oestrogens or even cause the tumours to regress, once they had been formed. He pointed out that an essential item in the production of such experimental fibroids was continuous dosage, for small doses of oestrogens so administered were more effective than large, spaced doses.

Martin and Moore⁸ and Barrie⁹ in England were also able to produce uterine fibromyomas in rats kept on a diet deficient in vitamin E. This finding appears to be analogous to those just cited, since the writer^{10, 11} has adduced a good deal of evidence for regarding vitamin E as an anti-oestrogen. In E deficiency states the level of body oestrogens tends to rise.

It would seem, from what has been said, that there might be good reason to suspect that the origin of human myomas could be ascribed to the same cause, namely, to a prolonged and constant oestrogenic stimulation. Indeed, Moench in 1929 and Witherspoon¹² in 1933 postulated this very origin for them. It is of interest, therefore, to note that both Greenblatt¹³ and Perloff¹⁴ have recently produced regression in size in human fibroids, using testosterone implants and injections, respectively. However, some recent writers^{15, 16} have expressed disbelief in the general thesis of the oestrogenic origin of human myomas.

It seemed to me that if the histories of women who had developed fibroids were analyzed it might be possible to shed some light on this problem. It appears that functional menorrhagia is associated with an increased oestrogenic level in the blood¹⁷ and that almost all such cases are controlled by the exhibition of such anti-oestrogenic agents as testosterone, progesterone, or, best of all, thyroid extract.¹⁸ Moreover, oestrogens are poorly excreted in the hypothyroid state, in animals at least,^{19, 20} and this raises the body's oestrogen level correspondingly. Accordingly, the histories of 130 consecutive, unselected women having fibromyomas were analyzed for evidence of old functional menorrhagias or hypothyroid states of long standing. As many of these women had long had organic menorrhagia we went back in their menstrual histories to the second decade of their lives when very few could have had complicating fibroids. The tumours in the series ranged in size from barely perceptible nodules of pea-size to some

ON THE OESTROGENIC ORIGIN OF UTERINE FIBROMYOMAS

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SINCE Lacassagne produced fibromyomatous changes in the uteri of rabbits¹ and mice² by means of injections of an oestrogen, there has been a good deal of corroborative animal work. For example, Nelson³ produced uterine fibromyomas in guinea pigs by means of oestrogens, as did Moricard and Cauchoux,⁴ Lipschutz,⁵ and Perloff and Kurzrok.⁶ Both Lipschutz *et al.* and Marx⁷ were unable to produce these tumours in rats, and Marx could not develop them in unspayed guinea pigs. Lipschutz produced his tumours with almost all of many oestrogens he used, even in males (in the subserosa of the

extending to the navel. The ages of the women ranged from 22 to 57 years; 23 were in the third decade, 56 in the fourth; 43 in the fifth; and 8 in the sixth decade of life. Of these 130, fully 52% gave a history of functional menorrhagia in the second decade long preceding the epoch when fibroids probably first appeared. Moreover, 63% of these women exhibited signs and symptoms of hypothyroidism. When it is remembered that elevated blood oestrogen levels may be associated with scanty menstruation or even amenorrhoeas, it is obvious that an analysis of second decade menstruation in which we selected only menorrhagia as a criterion is inadequate. At least it does not introduce an error unduly favouring our thesis. It may, however, explain why more hypothyroidism than functional menorrhagia was uncovered in the early history of fibroid-bearing women.

One seldom has occasion to give an oestrogen to a woman who already has a fibroid uterus, but in 1936 the writer administered 2,000 i.u. of theelin twice a week, in the first half of the cycle, for a year to an unmarried girl of thirty-one for a low-oestrogen type of dysmenorrhoea. It relieved her pain, of course, but in the course of thirteen months the uterus grew from the size of a two months' pregnancy to such a size as to choke the true pelvis. This accelerated growth of the tumour might have occurred in the absence of such oestrogenic therapy, obviously, but the case is reminiscent of one recorded by Portes²¹ in which a rapid enlargement of a uterine myoma was associated with a considerable spontaneous rise in the output of urinary oestrogens.

DISCUSSION

The series of fibroid-bearing women studied here is small and uncontrolled. It obviously lacks the definiteness characteristic of animal experimentation. But, somehow, we must attempt to bridge the gap between the very consistent and definite animal findings and our clinical experience.

One must be impressed, when taking the histories of women having fibroids, with the sequence of functional menorrhagia in early decades ending in organic menorrhagia in later decades. Again, one has time and again seen a menorrhagia that appeared to be due to fibroid tumours present respond quickly and completely to therapy with such an anti-oestrogen as thyroid extract or testosterone propionate. There are

few more effective kinds of therapy than such agents used to control functional menorrhagias. One cannot help but wonder if the functional menorrhagia had been controlled in the early decades would an organic menorrhagia have developed later.

The gynaecologist of the future, it is to be hoped, will not be satisfied with the mere diagnosis and extirpation of fibromyomas. He will hope to recognize them early and prevent their growth and interference with function, or better still, he will hope to recognize in the first two decades of life those women who are apt to develop fibroids later, and take preventive measures accordingly. Surely the time will come when he can point to the girl in her late teens or early twenties and warn her that she runs a good chance of developing fibroids unless prophylactic treatment is given and given persistently. As Lipschutz stressed, it is constant and prolonged stimulation by oestrogens that generates myomas. Prophylaxis should be equally constant and prolonged, and should obviously involve the administration of such anti-oestrogens as thyroid extract or vitamin E, if our thesis be correct.

SUMMARY

1. Oestrogenic stimulation induces the formation of uterine fibromyomas in certain species of experimental animals.
2. The histories of 130 consecutive, unselected women having fibroid uterine tumours were analyzed.
3. Fifty-two per cent of these gave a history of menorrhagia, probably functional, in the second decade.
4. Sixty-three per cent of them were hypothyroid.
5. Both functional menorrhagia and hypothyroidism are generally associated with high oestrogen levels in the body.
6. Human fibromyomas may be of oestrogenic origin. If true, this offers a clue to their prophylaxis, which should be one of the first aims of gynaecology. The prophylactic measures should probably include the use of such anti-oestrogens as thyroid extract or vitamin E.

REFERENCES

1. LACASSAGNE, A.: *C. R. Soc. de Biol.*, 1935, 120: 685.
2. *Idem*: *C. R. Soc. de Biol.*, 1935, 120: 1156.
3. NELSON, W. O.: *Anat. Rec.*, 1937, 68: 99.
4. MORICARD, R. AND CAUCHOIX, J.: *C. R. Soc. de Biol.*, 1938, 129: 556.
5. LIPSCHUTZ, A.: *J. Am. M. Ass.*, 1942, 120: 171.
6. PERLOFF, W. H. AND KURZROK, R.: *Proc. Soc. Exp. Biol. & Med.*, 1941, 42: 262.





7. MARX, R., GLASS, S. AND SHULMAN, A.: *Am. J. Obst. & Gyn.*, 1942, 44: 259.
8. MARTIN, A. J. P. AND MOORE, T.: *J. Hygiene*, 1939, 39: 643.
9. BARRIE, M. M. O.: *Biochem. J.*, 1938, 32: 2134.
10. SHUTE, E. V.: *J. Obst. & Gyn. Brit. Emp.*, 1936, 43: 74.
11. *Idem*: Vitamin E Symposium, London, England, April, 1939.
12. WITHERSPOON, J. T.: *Surg., Gyn. & Obst.*, 1935, 61: 743.
13. GREENBLATT, R. B.: *J. Am. M. Ass.*, 1943, 121: 17.
14. PERLOFF, W. H.: *J. Clin. Endocrin.*, 1942, 2: 419.
15. BREWER, J. L. AND JONES, H. O.: *Am. J. Obst. & Gyn.*, 1941, 41: 733.
16. HENDERSON, D. N.: *ibid.*, 1941, 31: 694.
17. SHUTE, E. V.: *Canad. M. Ass. J.*, 1936, 35: 622.
18. *Idem*: *Canad. M. Ass. J.*, 1939, 40: 38.
19. VAN HORN, W. M.: *Endocrin.*, 1933, 71: 152.
20. WEICHERT, C. K. AND BOYD, R. W.: *Anat. Rec.*, 1933, 58: 55.
21. PORTES, L.: *Bull. de la Soc. de Gyn. et d'Obstet.*, 1938, 27: 275.

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RÉSUMÉ

On sait, depuis les travaux de Lacassagne, que les œstrogènes favorisent le développement des fibromyomes utérins chez certains animaux de laboratoire. 130 femmes porteuses de fibromes utérine priées au hasard furent étudiées attentivement, et leur histoire révèle chez 52% d'entre elles un épisode ménorrhagique entre 10 et 20 ans, tandis que 63% étaient des hypothyroïdiennes. On sait que les ménorrhagies fonctionnelles et l'hypothyroïdie sont souvent contemporaines des dosages élevés d'œstrogène dans l'organisme. Pour conséquent, les fibromyomes humains seraient peut-être d'origine horminale. Si cette hypothèse se vérifie, la prophylaxie des fibromes serait assurée par l'administration d'extrait thyroïdien et de vitamine E, qui sont tous deux fortement antioestrogéniques.

JEAN SAUCIER

TOXIC HEPATITIS IN FEVER THERAPY

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FEVER therapy has established itself as a useful form of treatment in a number of diseases, especially neurosyphilis and in sulfa-resistant gonorrhœa. Prior to the introduction of penicillin, it was considered by many as the routine treatment for the latter disease. It is generally accepted as a relatively safe procedure if it is carried out in a well equipped clinic with experienced staff. Among the complications of artificial fever, jaundice is mentioned as a rare one and only occurring in cases of marked circulatory collapse, dehydration, or with low blood chlorides. This has not been our experience. We have encountered 48 cases in 250 patients treated for sulfa-resistant gonorrhœal infection in healthy young men. This is an incidence of 19.2%. Until the recent paper by King, Williams and Nichol,¹ and the related paper on physiological and biochemical changes following fever therapy by Wallace and Bushby,² no reference has been found of a comparable incidence of jaundice in such patients. On discussing the problem with several

other workers in Canada, I have been informed that it is not infrequent in their clinics.

Before discussing these cases, it seems advisable to outline our treatment routine. The patients were Navy, Army or Air Force personnel, who have been considered sulfa-resistant gonorrhœa and have been referred to us for fever therapy. They have been a very co-operative group and little difficulty was encountered in the administration of treatment. They were admitted to our hospital 2 days before treatment for investigation and examination. During these days they received ordinary diet, extra fluids, salt capsules of 1 gram 4 times daily, vitamin B₁, 18 milligrams daily and intramuscular vitamin B complex (beminal) 1/4 c.c. daily. In the 12 hours preceding therapy they were given 6 gm. of sulfathiazole or sulfadiazine if there was no history of toxicity. Special attention in familiarizing them with the nature of the treatment was found to be of great psychological help.

The induction period lasted about 1 1/4 hours to reach 106°. Treatment consisted of 7 hours above 106° and we endeavoured to keep the rectal temperature at 106.7°; care was taken that the temperature did not exceed 106.8°. Intravenous drip of 5% glucose in saline was routine after induction. Originally 1,000 c.c. was given but about 3/4 of the cases had 2,000 c.c. over a period of 3 to 6 hours, usually about 5 hours. This was supplemented by oral water or dilute 0.3% saline. Three or four injections of 50 c.c. of 50% dextrose or sucrose were given during treatment. Oxygen by means of a nasal B.L.B. mask was administered for 20 to 60% of the treatment period. Pantopon grain 1/3 was usually given during induction and at times a supplementary dose of grain 1/6 was given in the latter half of treatment. No sedation was used prior to admission to the cabinet.

On return to the ward patients were allowed fluids, but no attempt to force fluids was made for several hours. They were permitted bathroom privileges the next forenoon if the systolic blood pressure was over 100 and the patient felt well enough.

They were allowed up 24 hours after treatment if their general condition was satisfactory. In the days following the treatment fluids were forced and diet was modified according to their desires. Poor fluid intake, moderate vomiting, dehydration or evidence of circulatory collapse were treated by intravenous

therapy. Intake and output of fluids were not recorded in the majority of cases and decision as to dehydration was based on known vomiting, estimated intake, general condition of skin and tongue and urine specific gravity.

The cabinets in use were a D.P. and N.H. standard which are simple in design and have a fan behind a 2 element heating unit. The hot air is blown over a pan with wick towelling and results in highly saturated warm air which circulates up the sides and the foot of the mattress to the main body of the cabinet.

Brief consideration of the whole series is thought desirable before analyzing the jaundice cases. The 250 cases were consecutive ones. Two other patients, one with psychogenic tachycardia and the other unco-operative, were in the cabinet so short a period that they have not been included. One hundred and ninety-five patients had 1 session, 41 had 2 sessions, 12 had 3 sessions and 2 had 4 sessions of fever. In the series there were 21 patients who were removed from the cabinet before completing their 7 hours and 12 of these had less than 5½ hours. Treatment was stopped for tachycardia, excessive vomiting, temperature rising above 107° or delirium. One of them had convulsions at a temperature under 107° and no further attempt at treatment was made. Of those having less than 5½ hours of treatment, 3 resulted in a cure, while the remaining 8 had an uneventful second session. Of our whole series of 250 cases, there were no patients who refused a second or third session when we considered it advisable.

Of the 246 cases of gonorrhœal urethritis, we have had 9 failures, and 4 of these were in the group of 16 sulfa toxic patients who received fever without chemotherapy. Our apparent cure was 97.8% in the 230 cases who had our routine fever plus sulfonamide. Criterion of cure was based on disappearance of urethral discharge, negative under smear and culture and urine examination. There were 2 known relapses, one responding to another course of sulfonamide and the other to penicillin. It is estimated that 25 to 50% of our cases would be away from this area 1 month after discharge from hospital, so subsequent relapses, if any, in this group would be unknown to us.

INCIDENCE OF JAUNDICE

In our jaundice series of 48 cases, 5 patients were considered marked jaundice, 6 patients

moderate and the remaining 37 were mild or doubtful. Any of the doubtful cases had a raised icteric index usually about 15 to 20. With the exception of 4 mild but definite cases all other cases considered in this series had serum bilirubin investigations. As a rule any cases with an icteric index of 15 to 20, had a negative or slightly positive direct van den Bergh reaction while those above 20 were almost invariably positive direct.

Clinical icterus was usually detected on the 2nd or 3rd day after fever. Occasionally it was seen on the 1st day and sometimes not until the 4th day. In cases not noted until 2nd or 3rd day, a raised serum bilirubin was usually present on the 1st day. One example of a mild clinical case had the following icteric indices, 1st day 10, 2nd day 22, 3rd day 28, and 6th day 19. One case with icterus visible in the sclera on the 1st day after fever had an index of 38 with a positive direct van den Bergh. He subsequently developed a marked jaundice although he never appeared very ill. In only a couple of cases was the liver considered enlarged and never greatly so. Tenderness in the liver area was encountered a few times but one was impressed with the negative physical findings in the majority of cases. Two patients stated they passed several pale stools but these were not examined. The first urine was a positive test for urobilinogen and followed by bile. In those with marked jaundice and larger amounts of bile in the urine the urobilinogen was reduced or absent. In most of the cases the abnormal urine findings were of short duration as was the jaundice.

There were no cases of definite bradycardia noted although in most of the cases of marked jaundice there were pulse recordings of 56 to 70 for 1 to 2 days, in the period of 5 to 10 days after treatment when they were showing great clinical improvement. The more usual finding was a slightly increased pulse rate and in a moderate number there was a mild pyrexia of 99 to 100° for 1 or 2 days and occasionally longer.

In 2 of our earlier mild cases where a cure did not result in the session we repeated it in about 10 days' time with no ill effect or recurrence of jaundice. In 2 other more recent cases we referred them for penicillin although they were no worse than the first 2 failures on one session. The remaining 44 jaundiced pa-

tients obtained an apparent cure with one session.

CASES OF MARKED JAUNDICE

These cases had an average intravenous intake of 1,900 c.c. of 5% glucose in saline. In 4 of the 5 cases treatment was uneventful with no vomiting, while the fifth case had considerable vomiting of clear fluid and was confused during part of his treatment. This case required active treatment for marked circulatory collapse soon after his return to the ward. The case referred to above with an icteric index of 38 on the day following treatment, was one who had an uneventful 7 hour session, had no vomiting during treatment nor during the night following it and was feeling fairly well the next day when icterus was noted. Subsequently, he had moderate nausea and vomiting for several days but never appeared dehydrated nor looked seriously ill. He was one of a considerable group where the nausea and vomiting appeared to be the result of his toxic hepatitis rather than the cause. Another of these marked cases was uneventful until 24 hours after fever therapy when nausea and vomiting began and on the following morning icterus was visible and he had an index of 66. This patient's condition became worse and reached its peak on the 5th day with signs of cholæmia. Following this alarming state he improved steadily but still had an icteric index of 37 on the 17th day after his fever. This patient and the one with the marked circulatory collapse were the only ones whose condition appeared serious. We have had no fatalities at our clinic up to the present time.

CASES OF MODERATE JAUNDICE

Of the 6 cases in this group only 1 vomited during treatment and that was but once. The average amount of intravenous 5% glucose in saline was about 1,500 c.c. Two of these were confused during part of their session but otherwise their condition was satisfactory, while the remaining 4 cases had uneventful treatments. Following treatment one patient had no vomiting, 4 patients had moderate amount of nausea and vomiting, and the 6th case had marked vomiting and a 2nd degree burn of his shins.

CASES OF SLIGHT JAUNDICE

These cases, 37 in number, were not obviously different from many non-icteric cases and could easily be missed if not looked for carefully. Most of them had an uneventful treat-

ment and averaged nearly 2,000 c.c. of 5% glucose in saline intravenously. Following treatment a few had no vomiting, a few had marked vomiting but the majority had moderate nausea and vomiting for 1 to 3 days.

In considering the whole series of 48 cases of jaundice there are certain points that stand out. In the majority the treatment was uneventful although in some cases restlessness or even confusion at times was noted. In 30 cases no vomiting occurred during treatment and only 4 cases vomited more than twice. This compares favourably with the non-jaundiced group. The vomiting after treatment was more marked in the jaundiced patients but there were many cases with similar degree of nausea and vomiting who did not develop jaundice. Once again it is stressed that the clinical impression was that much of this vomiting was due to the hepatitis and not the cause of the jaundice. Herpes was noted in 60% of the cases, an identical figure to that of the non-jaundiced patients. This figure includes very mild herpes and some with no skin lesions but only inside the mouth. In the second half of our series the vitamin B premedication was discontinued to compare its alleged effect in the prevention of herpes. A slight increase was noted in the second half but it is of doubtful statistical significance.

There was no difference in the jaundice incidence in the cases receiving vitamins of the dosage given by us. In the earlier cases of our series we did not use any coverings except a jock strap and we found, contrary to some other clinics, that we were troubled with blisters of the feet in quite a few cases and we had three cases with burns of the shins which required remaining in hospital for treatment of the burns. Since we began oiling the feet and legs and covering them with terry cloth stockings we have had nothing more serious than mild blisters of one or more toes. It seems probable that the cause of the burns is the rather excessive heat at the foot of the cabinet if both heater elements are on, as our nurses did not have any trouble with burns in other cabinets of essentially the same construction with which they worked previously.

The first half of the cases was receiving sulfadiazine but it was then changed to sulfathiazole to see if there would be any lowering of the incidence of jaundice. No appreciable difference was noted.

DISCUSSION

The incidence of jaundice in our series is rather startling in view of the scarcity of references to the subject in the vast literature on fever therapy. It seems reasonably certain in view of the clinical picture, icteric index and urine findings that the majority of these cases do not suffer any irreparable liver damage. However, it is not so easy to be dogmatic in the cases of more severe and prolonged jaundice even though they made an uneventful clinical recovery. The possibility of permanent liver damage and knowing about several cases of death from acute liver necrosis following fever therapy makes one feel that this subject of hepatitis is deserving of more study.

It is generally known that in severe shock, such as in the one case of ours described above, jaundice may occur. Whether it is due to circulatory collapse or anoxia or both is not certain. There is a possibility of the mechanism of this syndrome, heat exhaustion, heat stroke, acute liver death and toxæmia of burns having features in common. However, one feels that the clinical picture was so different in that one case that it is probably more profitable to study the remaining 47 cases which had jaundice and were clinically more alike.

Anoxia may play some part in the etiology but Wallace² found jaundice in a series in which oxygen had been used continuously, and some clinics use no oxygen therapy and have not been struck by their incidence of jaundice. We believe that more extensive use of oxygen than has been our practice is probably desirable but cannot feel that this is the chief factor in the production of our jaundice.

We believe that the current American belief of the fluids and chloride etiology of jaundice is not proved. Our blood chloride analyses were not numerous enough to draw conclusions from, but when one considers the quantities of salt and fluids given before, during and after treatment, they are equal to or more than in the average fever therapy clinic. The statement of some people that on the appearance of early icterus an intravenous administration of saline will quickly result in its disappearance, is not in agreement with our experience. Some cases proceed on to moderate or marked jaundice even though intravenous therapy is started early, while most of the mild cases are very fleeting and soon disappear even without intravenous saline.

The blood counts and associated investigations of Wallace were against an haemolytic origin of the jaundice. Our van den Bergh reactions and urine findings support this and point to a liver cell damage.

One of the first thoughts we had on encountering the early cases of jaundice was the possibility of fever activating a latent infective hepatitis but on studying the series one is impressed by the rapidity with which a marked icterus may appear, and it seems improbable that an infective hepatitis could be so accelerated.

A similarity in some respects was noted between our cases of jaundice and the toxæmia of burns which occurs 1 to 5 days after the burn and is accompanied by nausea, vomiting, slight pyrexia and in some cases jaundice. Although some authors state that jaundice in burns is rare, Wilson,³ in his series noted 12 cases of jaundice in 65 serious burns and felt it would have been higher if closer observation was made in the earlier cases. The toxæmia of burns is usually seen in severe cases but not invariably so. The question of an actual blood circulating toxin in burns has much to support it but some authorities claim it is not yet proved and the recent work on the effects of tannic acid as a cause of liver necrosis will make the supporters of the toxæmia theory less secure. The fact that our cabinets were simple in design and that it was not as easy to prevent superficial burns as with more elaborately constructed cabinets led us to give thought to the possibility of a "toxæmia" theory of hepatitis. Such a theory would postulate a toxin resulting from a large area of skin being subjected to a relatively hot atmosphere for a period of about 8½ hours. Any such theory would require such a toxin being formed without the necessity of blister formation, as the percentage of jaundiced cases with blister formation was not appreciably greater than in the whole series. There is little evidence to support this hypothesis and one would have expected more jaundice in the older radiant heat cabinets which did not have the humidity of our modern apparatus.

We now come to what appears as the most probable main factor in the etiology of our jaundice, namely the direct effect of the high body temperature on the liver in patients who have a relatively high blood sulfa level. Although few clinics have been administering temperatures of 106.7° in the recent years, in treatment of neurosyphilis, there must have

been thousands of patients treated at such a temperature in the last 10 to 15 years and an incidence of jaundice such as we observed would have been noted in early years. In our limited experience of neurosyphilis treatments at about 105° we have never noted any jaundice. Of our 16 sulfa toxic patients who received fever therapy without chemotherapy none of them developed clinical jaundice but one had an icteric index of 20 on the first day after fever and is included in our jaundice series. The group of cases without chemotherapy is too small to draw any conclusions from but it is suggestive. The fact that in the 21 cases whose treatment was terminated before 7 hours was completed no jaundice was noted, is suggestive of length of fever having a bearing on the question and especially as these incompletely treated cases were made up of patients who had delirium and other evidence of anoxæmia or cerebral œdema, and in some cases marked vomiting following removal from the cabinet. Wallace states that sulfonamides do not increase the hazards, including jaundice, of fever therapy. He found a bilirubinæmia in cases given fever without sulfonamides but does not state when the previous drug administration was stopped. Most, if not all, of his subjects were sulfa-resistant gonorrhœa.

Among the toxic effects of the sulfonamides liver damage is generally considered an infrequent one. Nevertheless a considerable number of cases of toxic hepatitis from these drugs has been reported. Sulfanilamide is more toxic than sulfapyridine, while sulfathiazole and sulfadiazine would appear to be less toxic. Geever⁴ has recently reported on 2 fatal cases where the predominating pathological lesion was a liver damage attributed to sulfadiazine. Cantarow and Wirts,⁵ in their article on hyperbilirubinæmia following sulfonamide administration, quote cases of liver damage attributed to the drugs and they believe that routine determination of serum bilirubin and tests of hepatic function would probably reveal a much higher incidence of hepatic functional impairment than has been reported. With such evidence of potential or actual liver damage it does not seem strange that this injury could be aggravated by the abnormal temperature during fever therapy, which must in itself put a strain on an organ so intimately concerned with metabolism. This theory of the etiology of our toxic

hepatitis appears most plausible but further proof is still necessary.

The more satisfactory results of the combination treatment of fever and sulfonamides makes one hesitate to discontinue the use of chemotherapy with fever and we have adopted the advice of King and are giving large amounts of protein for 2 days before treatment and aiming at keeping the patient's temperature at 106.0° as well as the more liberal use of oxygen. The increased protein diet as a liver protective has arisen out of the work of Whipple and his associates and the numerous experimental and clinical reports which have appeared in the last few years.

SUMMARY

1. A review of 250 consecutive cases of gonorrhœal infection has been made.
2. Jaundice was present in 48 cases, giving an incidence of 19.2%.
3. A discussion of possible etiological factors has been attempted.
4. It is suggested that this condition is a toxic hepatitis largely resulting from the effect of the high fever on a body with a relatively high blood level of sulfonamide.

My thanks are due to Dr. C. Macleod, Chief Medical Officer of Camp Hill Hospital, Halifax, the nursing staff of our fever therapy clinic and ward and to Surgeon Lieutenant W. J. Elliott, who was associated with me in this work.

REFERENCES

1. KING, A. J., WILLIAMS, D. I. AND NICHOL, C. S.: *Brit. J. Ven. Dis.*, Dec., 1943.
2. WALLACE, J. AND BUSHBY, S. R. M.: *Brit. J. Ven. Dis.*, 1943, 19: 155.
3. WILSON, W. C., MACGREGOR, A. R. AND STEWART, C. P.: *Brit. J. Surg.*, 1938, 25: 826.
4. GEEVER, E. F.: *Am. J. M. Sc.*, 1944, 207: 331.
5. CANTAROW, A. AND WIRTS, C. W.: *J. Lab. & Clin. Med.*, 1942, 28: 71.
6. MILLER, L. L. AND WHIPPLE, G. H.: *Am. J. M. Sc.*, 1940, 199: 204; *Am. J. M. Sc.*, 1940, 200: 739; *J. Exper. Med.*, 1942, 76: 421.

INVEST IN VICTORY. In 1943, over 2½ billions of dollars were realized through the sale of Canada's Victory Bonds. Citizens dug deeply but when the year ended they still had more money on deposit in the banks than before. The objective of the 7th Loan is \$1.3 billions. Let's go well over the top.

THE VALUE OF THE ELECTROCARDIOGRAM IN THE DIAGNOSIS OF HEART DISEASE

By L. T. Williamson, M.D., C.M.

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THE main reason for writing this article is to point out many of the advantages and a few of the faults of electrocardiography. Too many doctors regard the electrocardiogram as the supreme court in the diagnosis of whether a patient has or has not heart disease. Many men in general practice send a patient for an electrocardiogram, and if the graph does not show any evidence of myocardial damage, consider that the heart is normal. The electrocardiogram is only an aid, and has to be correlated with your history, physical examination, laboratory findings, and 6-foot plate or orthodiagram of the heart.

In the average heart examination the value of an electrocardiogram is only 5 to 10% of the total value. I believe that the history ranks first, with a value of about 50%. By the history alone, one often makes a diagnosis of true angina, coronary insufficiency, or coronary occlusion, even when the electrocardiogram, when taken in the regular manner with the standard leads plus CF-IV or IV-F, is normal. Many of these so-called normal graphs will be a thing of the past, especially in coronary occlusion, when more chest leads are taken as advised by Dr. Frank N. Wilson, of the University of Michigan, and more especially if an indifferent electrode is used with a low potential. The physical examination has a value of about 25%, and the balance is made up with the laboratory findings, such as sedimentation rate, complete blood count, urine analysis, basal metabolism test, blood culture, etc., as indicated in the case. Vital capacity estimation is a very useful aid in diagnosing early congestive failure, and is a method that is often ignored altogether.

The more one uses and studies electrocardiography, the more one understands heart disease and its various abnormal mechanisms. Once this knowledge is gained, the less one depends on the electrocardiogram.

One should always have some knowledge of the patient in reading an electrocardiogram. If one does not have this information, I believe this is the reason many graphs are over read,

unless a very conservative attitude is taken. In hospital cases, many requisitions are sent in for electrocardiograms without any history or provisional diagnosis. The medication should be known, because drugs such as digitalis and quinidine affect the graph. Also the age, blood pressure, and type of individual, should be known by the one who reads the graph. A better way is for the doctor who attends the patient to read the electrocardiogram. If this is done, many of the pitfalls will be avoided. For example, there are many causes of a low or inverted T-wave, such as coronary disease, pericarditis, myxœdema, toxæmias, anoxæmia, digitalis, deficiency disease, acute myocarditis, tobacco, insulin, hypertensive heart disease, etc.

Many of our standards for reading electrocardiograms are not elastic enough, or are interpreted in too rigid a manner. If one takes electrocardiograms on a large number of individuals, many will show abnormal readings, if the standards are too rigid.

In spite of the above faults of electrocardiography, it is one of the most useful means in the diagnosis, prognosis, and treatment of heart disease.

The following are a few of its uses:

1. *Arrhythmias*.—These are sometimes very hard to differentiate as heart block versus frequent premature ventricular contractions. A slow ventricular rate in auricular fibrillation is often difficult to diagnose, as there is a complete or almost complete A-V block with a resulting fairly regular ventricular rate. The fast ventricular rate in auricular fibrillation is also at times difficult to diagnose, as counting it is hard and one is not sure of the pulse deficit. Partial A-V block with occasional blocked auricular contraction is difficult to tell with certainty.

2. *Tachycardias*.—As paroxysmal tachycardia of various kinds. Some of these, such as auricular tachycardia, are often harmless and are to be distinguished from ventricular tachycardia.

3. *Acute coronary occlusion*.—Here, in the typical case the diagnosis is easy, but often graphs have to be repeated to see if the graph is changing, and one should take more chest leads if only CF-IV or IV-F have been taken. Many cases of coronary occlusion with infarction come on gradually with signs of coronary insufficiency over a period from a few days to two weeks and the graph is often normal during this time. In such cases the graph at a later date will often be typical of an acute occlusion.

4. *Distinguishing valve lesions* as left axis deviation in aortic valve lesions and right axis deviation in pulmonary stenosis. Also in mitral stenosis the finding of right axis deviation helps to confirm the diagnosis, although electrocardiographic changes in mitral stenosis are a late finding.

5. When heart disease is suspected, but there are not any physical signs. Rheumatic fever may be taken as an example of this when one may find partial heart block present, as exemplified by a prolonged P-R interval, or some deformity of the ventricular complex. Also, the same may be found in diphtheria and various toxæmias.

6. *Hypertension*.—Here one may gain some idea of how long the hypertension has been present if the graph shows changes characteristic of left ventricle hypertrophy. Electrocardiographic changes usually occur before enlargement of the left ventricle can be definitely diagnosed by x-ray. If coronary disease is also present, it modifies the above mentioned changes. The latter is often difficult to ascertain.

7. *The differential diagnosis of chest pain*.—In such cases it is of very definite value, especially if an abnormal graph is found to account for the pain. It must be remembered that a normal graph may be found in the presence of angina pectoris, or coronary insufficiency. In such cases it is advisable to repeat the standard leads, after certain standard exercises,¹ and especially after food. Also a complete series of chest leads should be taken.

8. *Pericarditis*.—In many cases the graph changes are characteristic and the graphs undergo progressive changes, unless the pericarditis is quite localized. The main differentiation is from myocardial infarction.

9. *Control of cardiac treatment*.—This is especially useful in digitalis and quinidine therapy. If digitalis intoxication is suspected a graph should be taken. In cases of heart block, quinidine should not be used.

10. *Congenital heart disease*.—In such cases it is useful in gaining further knowledge as to the site of lesion and which chamber of the heart is enlarged.

11. *Diagnosing right or left cardiac hypertrophy*.

12. *Hypocalcæmia and other conditions causing a prolonged Q-T interval*.

13. In cases of drowning or electrocution.—In these or similar cases one may learn if the victim is dead, thus avoiding lengthy artificial respiration.

REFERENCE

- MASTER, A. M., FRIEDMAN, R. AND DACK, S.: The electrocardiogram after standard exercise as a functional test of the heart, *Am. Heart J.*, 1942, 24: 777.

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PRIMARY MALIGNANT TUMOURS OF THE SMALL BOWEL

(A Review of 26 Cases from the Toronto General Hospital)

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WHEREAS primary malignant neoplasms of the gastrointestinal tract are extremely common, there is a surprising variation in their incidence between the pylorus and the ileo-caecal valve. It is commonly stated in most textbooks that cancer of the small intestine is very rare. Nevertheless, isolated cases and many series of collected cases are now on record. Nickerson and Williams¹ published ten cases collected from the autopsy files over a period of 40 years at the Mallory Institute. Judd,² Rankin and Mayo³ and others have published similar series. In 1932 Raiford¹⁷ reviewed 986 tumours of the gastrointestinal tract, including both benign and malignant forms. In this excellent study he found that the small bowel accounted for only 88 cases (8.9%), of which 50 were benign and 38 (4.9%) malignant. Special attention has been paid by some writers to the different rarities within this already small group of tumours. Carcinoids have been studied in detail by Cooke,⁴ Humphreys,⁵ Masson⁶ and others. The less common sarcoma have been dealt with by Ullman and Abeshouse.⁷ In this present series we propose to review the malignant neoplasms collected over the past sixteen years at the Toronto General Hospital.

MATERIAL

Some series, like that of Nickerson and Williams,¹ have been obtained from autopsy files. While this is excellent from a pathological point of view, it is hardly justified from a

TABLE I

No.	History case	Initials	Age	Sex	Year	History	Site	Preoperative diagnosis	Gross	Microscopic	Metastases	Diagnosis	Disposition
1	09626	G.Y.	30	M.	1927	2 years' fatigue, 5 years' constipation, lump in abdomen for 8 months.	Upper ileum	None	Fungating mass into lumen of bowel, mucosa ulcerated and hard.	Deeply staining nuclei, massive growth, invasion and blood vessels in numbers.	Mesentery. Omentum.	Sarcoma (cell type uncertain).	Discharged improved. Last seen alive and well in 1944.
2	014026	C.R.	44	M.	1927	5 weeks' distension and epigastric pain referred to back.	Carcinoma head of pancreas.	2nd part duodenum.	Ulceration of posterior wall of duodenum 2 x 1.7 cm. with heaped ragged edges and a white mass growing from one edge of ulcer.	Irregular acini of epithelial cells.	Liver, pancreas, regional lymph nodes.	Adenocarcinoma.	Death. Autopsy.
3	011101	G.C.	65	M.	1927	3 years' loss of weight, 1 year increasing constipation, and complete obstruction for 2 days.	Annular constriction of jejunum, with ulceration and perforation at site of stricture.		Pseudodachin, clumps of atypical epithelial cells.		None	Adenocarcinoma.	Death. Autopsy.
4	011946	H.Y.	67	F.	1928	20 years' epigastric pains, worse after meals, constipated 12 years. Loss of weight for 6 months.	15 cm. below duodenal-jejunal junction.	Intestinal obstruction. Carcinoma of colon.	Mass size of walnut extending into lumen of bowel, with stenosis of duodenum, area of ulceration with heaped edges.	Irregular epithelial cells, pseudo-glandular formation, variation in size and shape of cells, invading duodenal wall.	Common bile duct, pancreatic and gastric lymph nodes, pleura, peritoneum.	Adenocarcinoma.	Death. Autopsy.
5	028940	I.B.	41	F.	1929	"Many years" of gas pains, flatulence and regurgitation 6 months pain in epigastrium, loss of weight and appetite.	2nd part duodenum.	Chronic cholecystitis.	Atypical epithelial cells with many mitotic figures.			Adenocarcinoma.	Death. No autopsy.
6	036078	P.D.	65	M.	1930	2 years increasing constipation, occasional blood in stools, required 2 A.B.S. and C's after each meal.	Duodeno-jejunal junction.	Cholelithiasis. Carcinoma stomach.	Atypical epithelial cells with pseudoglandular formation.			Adenocarcinoma.	Death. Discharge improved.
7	028485	W.J.	70	M.	1933	4½ months' sharp colicky pains around umbilicus. Examined in hospital, and discharged after repeated negative radiological investigations. Admitted 3 months later with acute small bowel obstruction. Laparotomy. Lane's kink found. Tumour incidental at operation.	Terminal ileum.	Acute small bowel obstruction.	Atypical epithelial cells in all layers of bowel wall, a few mitotic figures.		Regional lymph nodes (removed).	Adenocarcinoma.	Discharged improved. Well 7 years later.
8	081919	J.J.	70	M.	1933	2 years' fatigue; loss of weight and increasing constipation. Worse last 5 weeks. Crampy abdominal pains for 5 weeks.	Jejunum.	Carcinoma stomach.	Mass 9 x 8 x 5 cm. Invading mesentery and fungating within lumen of bowel.	Wildly proliferating cells, many with more than one nucleus, poor attempt at glandular formation.	Duodenum, jejunum, cæcum, verterebral, many lymph nodes.	Adenocarcinoma.	Death. Autopsy.
9	077972	E.S.	44	F.	1934	6 months' loss of weight and appetite, no pains, slight nausea, little vomiting. Slight constipation.	Duodeno-jejunal junction.	Obstruction of upper small bowel.	Fungating tumour 7 x 6 x 1.5 with constricting band narrowing lumen.	Atypical epithelial cells, pseudo-glandular formation, all coats infiltrated, very pleomorphic.	None.	Adenocarcinoma.	Discharged. Died at home 2½ years later of metastases. No autopsy.
10	086344	J.M.	66	M.	1934	4 years' constipation, tender abdominal mass 6 months. Occasional crampy abdominal pains for 2 years, admitted with obvious small bowel obstruction.	Mid ileum.	Acute intestinal obstruction. Carcinoma sigmoid?	Pedunculated, lobulated tumour attached to outer side of ileum 16 x 8 x 9 cm., derived from muscular coat.	Atypical spindle cells, like smooth muscle fibres, a few mitotic figures, some arranged in whorls.	Leiomyosarcoma.	Discharged improved.	
11	0101744	J.K.	59	M.	1935	2 months' nausea and vomiting, abdominal discomfort, loss of 36 lbs. weight, borborygmi.	2nd part duodenum.	Incomplete upper intestinal obstruction. Carcinoma small bowel.	Large fungating tumour within lumen of bowel. Almost complete obstruction.	Meatery. Omentum.	Adenocarcinoma.	Discharged relieved. Died at home one year later.	
12	A4010	M.B.	50	F.	1936	Gastrointestinal upsets, nausea and vomiting 3 years before, crampy pains, fat intolerance, duodenal ulcer, gastroenterostomy one year before. Gradual onset of painless jaundice.	Carcinoma of head of pancreas. Carcinoma of ampulla.	Annular growth of mucosal surface, fungating from edge of ulcer, irregular polypoid structures not related to pancreas or ampulla.	Large irregular distorted pseudoglandular structures lined by atypical columnar cells.	None.	Adenocarcinoma.	Death. Autopsy.	
13	095168	J.R.	24	F.	1936	Pain and postprandial epigastric distress for 2½ months. Loss of weight, nausea and vomiting and weakness for 2½ months.	Duodeno-jejunal junction.	Mesenteric artery compression with high g.i. obstruction.	Large cells with pale staining nuclei, endothelial cell types, many Dorothy Reed giant cells.	None.	Primary disease of small bowel.	Discharged improved. In good health in March 1944.	
14	A14445	T.W.	56	M.	1936	10 years' pain after meals, relieved by soda and milk, sudden onset of acute abdominal pains 5 hours before admission.	Perforation of peptic ulcer.	Just distal to duodeno-jejunal junction.	Fungating mass 10 cm. in length attached to mucosal surface of jejunum.	None.	Adenocarcinoma.	Death. Autopsy.	

No.	History case No.	Initials	Age	Sex	Year	History	Site	Preoperative diagnosis	Gross	Microscopic	Metastases	Diagnosis	Disposition
15	PA5064	J.R.	60	M.	1938	1 year acute crampy abdominal pains, bowel obstruction.	Terminal ileum (16 in. from ileo-caecal valve).	Small bowel obstruction.	Rounded yellowish mass size of walnut in wall on mesenteric border, covered by intact mucosa.	Columns and nests of rounded and polyhedral cells, separated by dense band of fibrous tissue, hyperchromatic nuclei.	Regional lymph glands.	Carcinoid.	Discharged improved.
16	A46571	A.M.	56	M.	1938	5 years' inguinal hernia, nausea, and vomiting, distension of abdomen for 3 days. Acute crampy abdominal pains.	Mid ileum.	Small bowel obstruction from strangulation, (tumour was incidental finding in hernial loop).	Several small button shaped tumours, slightly raised from surface of mucosa, no puckering or infiltration.	Columna and nests of polygonal epithelial cells, hyperchromatic nuclei, granular acidophilic cytoplasm.	None.	Carcinoid.	Died in hospital of pneumonia.
17	077711	L.B.	64	F.	1940	10 months' constipation and epigastric pain. 6 months' nausea and vomiting.	Duodenum 2nd part.	Carcinomatosis peritonei of unknown origin.	Fungating mass, sessile on anterior wall of duodenum.	Marked variation in size and shape of cells, very malignant cells with atypical nuclei, much fibrous stroma, much invasion.	Lymph nodes, gall bladder, liver, lung.	Adenocarcinoma.	Death, Autopsy.
18	A81691	F.B.	65	F.	1941	Appendix removed in 1913. Nodules taken from faliform ligament and liver. History of 21 years' pain in abdomen, attacks of distension and jaundice.	Terminal ileum.	Endotheliomas of liver.	Numerous hard nodules in terminal ileum, palp. secondary nodules in liver.	Seen growing into portal vein, argyrophilic cells, regular, in size and shape, irregular masses of stroma. Review of 1918 slides confirms present diagnosis.	Liver, peritoneum, small bowel.	Carcinoid.	Died, No autopsy.
19	B94113	T.R.	62	F.	1941	27 years' history of epigastric pain relieved by vomiting or soda. Loss of weight and increasing constipation for 8 months.	Jejunum.	None.	Constricting band, raised mucosal surface, hard infiltration process of bowel wall. No ulceration.	Malignant cells in adjacent normal tissue. Deeply infiltrating cells into muscle coat of small intestine.	Umbilicus vagina.	Adenocarcinoma.	Died at home 2 years after discharge, of jaundice and palp. masses in liver.
20	B11849	A.McQ.	65	F.	1942	1 month nausea and vomiting after eating mushrooms, epigastric distress and loss of 25 lbs. (time unknown). Vomiting 2 - 3 hours after meals.	Jejunum.	Carcinoma of jejunum.	Constriction almost completely encircling bowel annular, raised on mucosal surface, ulcerated.	Atypical cells forming poorly developed glands closely packed in columns and cords, mitotic figures.	None.	Adenocarcinoma.	Died at home one year discharge.
21	B13874	V.W.	35	F.	1942	2 years' anaemia, positive for blood in stools. Indefinite indigestion, repeated examination of large bowel and stomach by radiology entirely negative.	Duodeno-jejun al junction.	Anæmia of unknown origin.	Large fixed fungating tumour invading neighbouring structures.	Many pseudoglandular formations with atypical cells, many mitotic figures.	Mesentery, regional lymph nodes.	Adenocarcinoma.	Died at home 21 months after discharge.
22	082442	F.O.	48	M.	1942	7 weeks' nausea and vomiting after 3 meals, loss of weight and energy for 4 months.	3rd part duodeno-jejunum.	Carcinoma of stomach.	Mass 23 x 17 x 11 cm. infiltrating sub-serosal surface duodenum, soft, semifluid, 16 cm. from pylorus.	Little connective tissue, no differentiation, invading muscle coats, mitotic figures.	Mesentery, liver, lymph nodes.	Adenocarcinoma.	Death, Autopsy.
23	B40753	D.T.	70	M.	1943	3 years' vague abdominal pains, worse for 2 months. Loss of 60 lbs. in 3-4 months. Loss of appetite, nausea and vomiting.	6 in. below duodeno-jejun al junction.	Chronic cholecystitis. Carcinoma of colon (?)	Irregular mass 8 x 5 x 3 cm. with raised edges and deep central base, necrotic surface.	Irregular staphylial glandular elements with columnar epithelial cells, loss of polarity, occasional mitotic figures, invasion of bowel wall by tumour cells.	None.	Adenocarcinoma.	Discharged improved. Gained 20 lbs. in first 6 weeks.
24	B34922	S.G.	55	M.	1943	General malaise and loss of weight for 8 months. Nausea and vomiting for 4 months. Melena for 1 week.	Ileum.	Gastric ulcer with adhesions to bowel wall.	Large mass lying in lumen of bowel, edges covered with normal mucosa. 4 cm. diameter.	Reticular cells infiltrated through to peritoneal surface. (Special stains used).	Lumbar vertebrae, ileum.	Reticulum cell sarcoma.	Discharged, improved, now being treated for secondaries by radiation.
25	B30734	M.D.	53	M.	1943	2 months' weakness and fatigue, anaesthesia with no response to iron or liver.	7 in. above ileo-caecal valve.	Brain tumour (patient was operated on for secondary tumour in brain).	Large polyhedral cells, clear cytoplasm with little pigment, cut surface white with red excavations, nearly second no due with normal mucosa.	Brain, lung, dura, regional lymph glands.	Malignant melanoma.	Death, Complete autopsy.	
26	B31830	H.McA.	43	F.	1943	Incidental finding at autopsy following pituitary adenoma operation. Jaundice, nausea and vomiting. 9 years previously but no gastrointestinal upsets since.	Jejunum.	None.	Groups of cell clusters in mucosal wall of jejunum, no evidence of disease in appendix.	None.	Carcinoid.	Incidental finding at autopsy.	

clinical one. The danger is in assuming that all cases of small bowel cancer are fatalities. This assumption will exclude many cases of five or more year cures, and carcinoids which are less lethal than carcinomas. These are all seen in the present series. What, then, shall be the criteria for inclusion in this series? To be included, a case may be a case of primary malignant disease proved by autopsy, or it may be included by operation and pathological investigation, when all reasonable doubt has been removed as to its being a growth secondary to a primary in stomach, large bowel or rectum. Any case with neoplastic disease in any of these sites is of course excluded. To rule out this possibility thorough radiological examination must have been carried out. On this basis 26 cases are hereby presented. A summary of each case, with history and pathological report is shown in Table I.

FINDINGS

The cases are as follows:

	Site	Number
Adenocarcinoma	1st part duodenum.....	0
"	2nd part duodenum.....	4
"	3rd part duodenum.....	1
"	Duodeno-jejunal junction and jejunum	11
"	Ileum	1
		—17
Sarcomas		4
Carcinoids		4
Primary Hodgkin's disease of small bowel.....		1
		—
Total		26

While the number of this series is small it is interesting to compare the frequency of these tumours with that found by other observers. Adenocarcinoma of the duodenum, according to Geiser,⁸ arises in about 4% of all intestinal carcinomas. Ewing⁹ described them in three sites. (1) *Parapyloric*—probably following duodenal ulcers in the first part of the duodenum. (2) *Peri-ampullary*, at the ampulla of Vater and (3) *pre-jejunal*, in the third portion of the duodenum.

The relative frequency of tumours in these sites is stated as approximately 2:6:1. This series supports the claim that duodenal malignant disease tends to occur most frequently in the peri-ampullary region. The onset of a painless jaundice which is said to characterize malignant change here was seen in only one case. Three of the four gave a history of a year or more of gastrointestinal upsets, suggestive of ulcer or cholecystic indigestion (see below).

Adenocarcinoma of the small intestine exclusive of the duodenum is said to occur in 3% of intestinal cancers (Ewing⁹). This suggests a slightly greater frequency of duodenal over jejunal-ileal cancer. This is not borne out by this series where the ratio is 5 to 12. It is believed that polyposis shows a definite tendency towards malignancy. Ewing states "the majority of intestinal carcinomas are of this type". In this series it is indeed difficult to prove or disprove this assertion but one doubts somewhat whether this is as frequently the case as is supposed.

Carcinomas tend to develop at extreme upper and lower ends of small bowel leaving the central portions free. This is borne out here by 11 cases in the jejunum or duodeno-jejunal junction and one case in terminal ileum.

Less common than adenocarcinoma, sarcoma is more common in small than in large bowel. Ullman and Abeshouse⁷ state this ratio is approximately 2 to 1. This series includes only four cases, about 14% of the total, made up of one sarcoma of uncertain cell type, one reticulum cell sarcoma, one malignant melanoma and one leiomyosarcoma. In the melanoma, where the primary nature of the tumour might be questioned a complete autopsy was obtained and the diagnosis firmly established. All four cases occurred in the ileum, thus conforming to the accepted view that sarcomas of the small bowel occur most frequently in the ileum.

Rankine¹⁰ reporting two cases of leiomyosarcoma of small bowel, and quoting Brink and Laing¹¹ states that of 250 cases of sarcomata only 14 were leiomyosarcomas up to 1933; since then he states the number has been brought up to 22. This emphasizes the rarity of this condition. For a fuller discussion of the various theories of origin of these interesting tumours the reader should consult Rankine's original paper. If leiomyosarcoma is rare how much more so is a primary melanoma of small bowel? Melanomas themselves are not uncommon and the wards of larger hospitals are seldom without at least one case. But these are nearly always melanomas of skin or eye, rarely in other sites. The only recent record of a similar case known to me is that reported by the Russian observer Zamler¹² in 1940. Ewing reports however that melanomas of intestines (large and small bowel and rectum) form 2 to 3% of all melanomas and occur in adults. However, the rectum and anal canal

claim the vast majority of these cases and those occurring in small bowel must be very rare indeed.

Reticulum cell sarcoma, of which this series contains one is another rarity. Recent work by Adamstone¹³ on vitamin E-deficient chicks points to a relationship between ulceration and production of reticulum cell sarcoma on the one hand, and the administration of vitamins A and D to chicks on iron-treated diets on the other. This work still requires further investigation and its application to the rare cases of human disease still requires an explanation. According to Boyd¹⁸ the reticulum cell sarcoma is regarded as a form of lympho-sarcoma. It has varied sites including bone, where it was formerly mistaken for Ewing's tumour of bone. Characteristically this tumour is radiosensitive. Jenkinson and his co-workers¹⁹ have proved that this sensitivity can appreciably improve the prognosis of sufferers of this tumour. In their review of lymphosarcomas, 8 of which were of the reticulum cell type, one occurred in the intestines. In the case reported in this series the patient is alive and well after nearly one year since radiotherapy.

This series contains four carcinoid tumours, or 14% of the total series. These tumours have attracted wide interest since their differentiation from carcinomas by Lubarsch in 1888. They were first named "carcinoid" by Oberndorfer in 1907. Usually they arise in the appendix and may not be recognized at time of operation. Nevertheless they do occur with some considerable frequency in small bowel, usually the ileum, and have been reported in stomach and colon. Masson⁶ has proved that they are related to certain endocrine cells, Kulschitsky cells, belonging to the chromaffin system and intimately related to the sympathetic system.

Humphreys⁵ studied 152 cases in the intestines and found 30% were multiple primaries and 24 cases had metastases. Raiford²¹ in 1933 reported a series of 29 carcinoid six of which showed secondaries in the liver. That these tumours are not "killing" tumours is evidenced by the fact that one case in this series, (Case 18) survived 25 odd years from the time a biopsy proved the presence of these tumours in liver. These must have been metastases at that time. One wonders in reviewing the case whether the appendix which was removed in 1913 might not have shown carcinoid changes,

not recognized at that time. The sections removed in 1918 are available and today reveal the well known architecture of the argenta-finoma tumours.

Writing in 1934, Christopher¹⁴ reviewed the literature on iliac carcinoids and announced that up to 1930 only 70 cases were on record. Wider recognition of this tumour has greatly increased this number. Humphreys,⁵ also in 1934, was able to report 152 cases up to that year. Carcinoids of the appendix are relatively innocuous. When these tumours occur in small bowel they are more malignant, have a greater tendency to metastasize and invade vital structures. The favourite sites for secondaries are the liver, peritoneum, regional lymph nodes and the small bowel itself. Christopher reported that of his 70 cases, 12 had secondary growths in peritoneum, 6 in regional lymph glands, 7 in liver and one in pleura. At the same time he reported a "cure". This seems less remarkable now in the light of our present conception of the disease (see cases 15 and 18). This point is good proof of the danger of studying malignant tumours from autopsy records alone. Were it not for incidental cases picked up at routine autopsy examinations few if any of these not infrequent tumours would be discovered.

One case of Hodgkin's disease of small bowel is included. This disease is not usually considered with other primary malignancies of small bowel and again would certainly not be included in a pathological series from autopsy material. Operation was performed 8 years ago and since then the patient has remained in excellent health and free from symptoms. She was seen by the writer several days ago in excellent spirits and showing no evidence of malignant disease. A similar case of primary Hodgkin's disease in jejunum is reported by Badia.²⁰

Etiology of Bowel Tumours

When one comes to consider the origin of small bowel tumours, one is struck at once by the remarkable change in incidence between pylorus and ileo-cæcal valve. Carcinoma in some part of the body is found in 10% of all autopsies, and 8.56% are primary in gastrointestinal tract. Yet small bowel primaries represent 0.062% of all carcinomas of the gastrointestinal tract.³

Rankin and Mayo³ consider the nature of the intestinal contents of prime importance. They point out that the fluid nature, relative alkalinity and absence of abrupt bends play a major rôle, presumably reducing irritation to the mucosal lining. One point however has not been sufficiently emphasized. Anyone who has watched the progress of a barium meal under a fluoroscopic screen is struck by the speed with which a bolus passes between the intestinal sluice gates, the pylorus and the ileo-caecal valve. The actual length of time any one bolus is in contact with any one mucosal surface is merely a matter of seconds. On the other hand food may remain in the stomach for hours and in the large bowel for days. The irritative effect of bowel contents is certainly minimized in all portions of small bowel.

In regard to the second portion of the duodenum there occurs at the ampulla the junction of two different types of epithelium. This has long been known to be a predisposition for malignancy, as evidenced at the lips, pylorus, cervix and rectum. Carcinoids have already been⁴ discussed with relation to Kulschitsky cells and the chromaffin system. The function of the particular cells is as yet unknown, but Masson's⁶ work proves fairly conclusively that carcinoids have their stems in these particular cells.

Reviewing the cases of adenocarcinoma, one notices the many cases that give long histories of gastrointestinal upsets, nausea, vomiting, epigastric distress, often relieved by milk or soda, of vague abdominal pains or some special food intolerance. Rankin and Mayo³ made the same observation in their cases and in reviewing Judd's series. This seems to suggest the presence of a long-standing ulcer condition. (Case 12 was operated on one year prior to admission for duodenal ulcer and subsequently developed adenocarcinoma of the 2nd portion of the duodenum.)

AGE AND SEX INCIDENCE

The seventeen cases of adenocarcinoma are divided equally between the sexes. The male preponderance so marked in other gastrointestinal neoplasms does not seem to hold in small bowel tumours. Ewing⁹ reports Schleips as finding equal sex incidence in his series in 1908 of jejunal and ileal adenocarcinomas. While the age incidence as a whole is 57.4 years that of the males is considerably older being 60.8

and the females 53.5 years. These figures are all considerably higher than those given by other contributors. Rankin and Mayo found that their total series of 55 cases averaged 47.5 years while Ewing⁹ states that the average age is 46.5 years.

SYMPTOMS

As already stated, the symptoms in many cases were of quite long standing. One patient had 20 years and another 27 years of gastrointestinal upsets. Of the seventeen the average length of time from the onset of symptoms to time of operation was 4.8 years. However, there was such a wide variation between a few weeks to 27 years that little importance should be placed on this figure, beyond pointing out that many cases had years of symptoms before they showed clinical evidence of intestinal disease. No one is expected to believe that malignant disease, especially in the active phase seen here, has been present for the length of time the symptoms might imply. One does strongly suspect irritative processes at work which finally bring about malignant changes.

Symptoms are nearly always referable to mechanical obstruction. The tumour may be one of three types, (1) which engirdles and strangles the bowel, (2) which by its fungating massive growth obstructs the lumen or (3) which by a process of slow infiltration finally brings about stricture of the lumen.

Pain is not characteristic of this condition until obstruction supervenes. The symptoms may be divided into two groups, those of long-standing irritation and those of the acute obstructive phase. Occasionally there is a history of tarry or bloody stools. The obstructive phase includes nausea and vomiting, jaundice especially in carcinoma of the 2nd part of the duodenum, loss of weight, loss of appetite and increasing constipation.

PROGNOSIS

The outlook for adenocarcinoma, as we see them now, is poor indeed. There are usually metastases when the cases are admitted, 11 of the 17 in this series had secondaries and 9 died in hospital. Of those that left hospital 5 died within two years. Swenson¹⁵ at the Presbyterian Hospital, in reporting 49 primary malignant tumours, believes many advances are yet to be made in earlier radiological diagnosis. This would undoubtedly alter the prognosis a great deal.

For those patients with carcinoids the outlook is much brighter. The rarer sites for these tumours are known to be more malignant cases. Thus intestinal tumours are more lethal than appendiceal ones, and those found in stomach or large bowel are as severe as true carcinomas. But even with metastases the tumours offer no threat to life unless obstruction (intestinal or biliary) is brought about. Forbus¹⁶ in reporting 6 cases, 2 primary in small bowel was one of the first to point out the innocuous nature of these growths.

PREOPERATIVE DIAGNOSIS

The most complete failure of recognition of primary neoplastic disease of small bowel is no reflection on the acuity of the surgeon. Most cases were operated on for an acute obstruction, often in the absence of a palpable abdominal mass. Often the issue was confused by the long history of ulcer or ulcer syndrome. Duodenal ulcer, cholecystitis or perforation were the commonest diagnoses.

CONCLUSIONS

A review of the files of the Toronto General Hospital has shown 26 primary malignant diseases in small bowel in the past sixteen years. These have been presented with a summary of the history, pathology and follow-up where obtainable. The following points have been made.

1. Adenocarcinomas are the commonest small bowel malignancies and occur most frequently around the second part of the duodenum and duodeno-jejunal junction.

2. Sarcomas are much more rare. Cases included in this series are a melanotic sarcoma, reticulum cell sarcoma, a spindle cell sarcoma and a leiomyosarcoma. One sarcoma case is alive and well 16 years after resection of small bowel.

3. One case of Hodgkin's disease is included, and is alive and well after 8 years of excellent health.

4. Etiology of bowel tumours is briefly reviewed. The age and sex incidence is found to differ somewhat from the accepted incidences of other series. The age group as a whole is older and the female are a younger group than the males.

5. Symptoms and prognosis are briefly discussed.

I wish to thank Dr. R. Janes for criticism and suggestions in the preparation of this paper.

REFERENCES

- NICKERSON, D. A. AND WILLIAMS, R. H.: *Am. J. Path.*, 1937, 13: 53.
- JUDD, E. S.: *Journal-Lancet*, 1919, 39: 159.
- RANKIN, F. W. AND MAYO, C.: *Surg., Gyn. & Obst.*, 1930, 50: 939.
- COOKE, H. H.: *Arch. Surg.*, 1931, 2: 568.
- HUMPHREYS, E. M.: *Am. J. Cancer*, 1934, 22: 765.
- MASSON, P.: *Am. J. Path.*, 1928, 4: 181.
- ULLMAN, A. AND ABESHOUSE, B.: *Ann. Surg.*, 1932, 95: 879.
- GEISEL: Quoted by Ewing, J. in *Neoplastic Diseases*, 4th Ed., Saunders, Phila., 1940, p. 721.
- EWING, J.: *Neoplastic Diseases*, 4th Ed., Saunders, Phila., 1942.
- RANKINE, J. A.: *Canad. M. Ass. J.*, 1943, 48: 415.
- BRINK, J. R. AND LAING, G. H.: From *Trans. Chicago Path. Soc.* as published in *Arch. Path.*, 1933, 16: 316.
- ZAMLER, L. E.: *Novy khir. Arkhiv.*, 1941, 48: 152.
- ADAMSTONE, F. B.: *Am. J. Path.*, 1941, 31: 717.
- CHRISTOPHER, F.: *Surg., Gyn. & Obst.*, 1934, 58: 903.
- SWENSON, P. C.: *Rev. Gastroent.*, 1943, 10: 77.
- FORBUS, W. D.: *Bull. Johns Hopkins Hosp.*, 1925, 37: 130.
- RAIFORD, T. S.: *Arch. Surg.*, 1932, 25: 122.
- BOYD, W.: *Surgical Pathology*, 5th Ed., Saunders, Phila., 1942.
- JENKINSON, E. L., KINZER, R. E. AND BROWN, W. H.: *Am. J. Roent.*, 1942, 48: 433.
- BADIA, P. D.: *Am. J. Surg.*, 1943, 59: 601.
- RAIFORD, T. S.: *Am. J. Cancer*, 1933, 18: 803.

TUBERCULOUS LESIONS OF OTHER ORGANS CONCURRENT WITH RENAL TUBERCULOSIS*

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BY way of introduction I should like to describe to you the plan which is used at the Toronto Hospital for Treatment of Tuberculosis, near Weston, Ontario, in order to discover the presence of renal tuberculosis. Every patient on admission or re-admission for any cause has a sterile specimen of urine cultured for tubercle bacilli. If the first specimen contains pus cells or red blood cells, a second culture is planted within the next few days.

Routine urinalysis is done every six months in the case of patients who remain in sanatorium, and, if voided specimens contain pus, etc., sterile specimens are obtained and cultured. Special attention is paid to cases of bone and joint tuberculosis. *B. tuberculosis* cultures of urine are planted every four months as long as these patients remain in hospital.

All patients who have *B. tuberculosis* in the urine or persistent pyuria in the absence of ordinary organisms are investigated by cystoscopy, in addition to patients who present themselves complaining of bladder symptoms or of scrotal swelling due to epididymitis.

* Read before a combined meeting of the Section of Pathology with the Section of Urology, Academy of Medicine, Toronto, February 22, 1944.

In the 13½ years during which the Urology Service has been in operation at Weston, under the direction of Dr. J. C. McClelland, some 293 cases of genito-urinary tuberculosis have been seen. As much investigation as possible has been carried out in keeping with the general condition of the patients. Some patients remain in hospital for long periods of time (even up to 8 or 10 years), while others have died before the admission cultures of urine have been reported, so that the amount of investigation of the individual patient varies considerably. Approximately four hundred cystoscopies have been done, 35 nephrectomies have been performed and 29 autopsies have been reported upon. This series of nearly 300 patients has provided opportunity for a good deal of study.

I. BILATERAL RENAL TUBERCULOSIS

In considering other organs which are involved by tuberculosis in association with renal disease, we shall deal with the contralateral kidney first. Until two or three years ago our records showed that approximately 50% of cases of renal tuberculosis were bilateral clinically when first diagnosed. This figure has been reduced to 35%, because of the number of cases which have been discovered before the onset of symptoms by means of urine cultures for tubercle bacilli. From the standpoint of the pathologist, it may be perhaps correct that practically all cases of renal tuberculosis are bilateral, but, clinically, the figures given above are true.

II. TUBERCULOUS EPIDIDYMITIS

Among the 221 male patients in the series, there were 126 (57%) cases of epididymitis, old and recent. More than one-third of these were bilateral. An attempt has been made to decide whether the involvement of the genital organs in these cases was secondary to urinary tract infection or due to spread by blood stream from active foci in other parts of the body. While it is probable that in the majority the appearance of epididymitis is a sign of kidney disease, we have been able to rule out clinical renal tuberculosis by cultures of ureteral specimens and pyelography in eleven patients. Three post-mortem studies have been made in these cases and no tuberculous foci were to be found in the kidneys on ordinary pathological examination. There is no reason to suppose that every case of tuberculosis of the epididymis is renal

in origin. Some cases may be due to blood-stream spread from some other organ.

In only one case has excision of genital tuberculosis been performed — an orchidectomy ten years ago. The remainder of the patients have been treated by bed rest, local support, heliotherapy, aspiration of abscesses when necessary, and antiseptic (Keith's) dressings to sinuses to prevent secondary infection. It has been interesting to observe patients in whom epididymectomy or orchidectomy or vasectomy had previously been performed in other hospitals. Operation may not always have been done to prevent spread of infection to the second side, but this has happened in 37% of the cases which we have seen in sanatorium subsequently. (The incidence of bilateral epididymitis in the whole group has been 38%).

The reason for this conservative type of treatment is that we try to retain as much testicular tissue as possible and we feel that the extra time spent in sanatorium for this purpose has been justified. Autopsy reports published by many workers show that the prostate is frequently involved by tuberculosis, even though the gland feels normal on rectal examination. It would seem, therefore, that when spread occurs it may just as well be from an occult lesion in the prostate or seminal vesicles as from the more obvious lesion in the epididymis.

III. TUBERCULOUS CYSTITIS

Aside from epididymitis, bladder inflammation is the only common symptom of renal tuberculosis. But the severity of cystitis is not necessarily a measure of the amount of kidney destruction. Only 42 or 14% of our cases of renal tuberculosis have had severe cystitis and as many as 137 or 47% complained of no bladder symptoms whatever.

Eleven nephrectomies have been performed upon patients who were found to have *B. tuberculosis* in the urine in the absence of bladder symptoms. One of these had epididymitis and a second had complained of upper abdominal pain which at first was thought to be due to gall-bladder disease; otherwise they would not have been investigated with renal tuberculosis in mind. Pathological examination of these kidneys showed that tuberculous abscesses were present in them all. Ten contained abscesses larger than 1 cm. in diameter and several showed multiple caseous areas, most of which had excavated at least in part. One kidney was an

empty shell with no recognizable renal tissue in its walls on gross examination. In the eleventh case a small cavity was found at the tip of one of the calyces.

We consider that nephrectomy was justified in each one of these cases, for the renal involvement had reached the stage of excavation and would certainly have progressed and led ultimately to the appearance of bladder symptoms, which, as every urologist knows, do not always disappear following nephrectomy. At autopsy several cases have been seen to have excavating lesions of the kidney. Those patients had had pus, albumen and sometimes tubercle bacilli in the urine but had never complained of cystitis.

A number of asymptomatic cases with tubercle bacilli in the urine have been investigated by cystoscopy and pyelography and have been found to have negative kidney specimen cultures and normal pyelograms. Seven such cases have been found in our series. Three were men who were free of epididymitis and four were women. These were apparently cases in which small renal lesions discharged bacilli occasionally and then became healed. There was no cystitis visible at the time of cystoscopy in any of the seven cases.

IV. TUBERCULOUS OPERATIVE WOUNDS

Twenty-two cases of infected nephrectomy wounds have been seen at Weston as well as two unhealed ureterectomy incisions and four discharging wounds following orchidectomy or epididymectomy. Only two of the whole group were our own, the others having been transferred to us from other hospitals for convalescent treatment. Five of the patients died with the nephrectomy wound unhealed.

Complete primary healing has been obtained in all but two of our cases. One of these was a desperate case of pyonephrosis who died 48 hours after operation. We feel that our preoperative treatment of the patients has contributed to this happy result, and perhaps good luck has played a part, too. Many of the patients are already in the sanatorium under treatment and the newly admitted patients are kept in bed until all the culture reports have been received before proceeding with nephrectomy. This allows a period of two months' bed rest preoperatively. At the operation the kidney is removed with as little manipulation as possible. No attempt is made to remove more than three or four cm. of ureter nor is a separate ureterectomy incision

made. A small rubber drain is left in for 48 hours and then removed. In this way we interfere with the kidney bed and surrounding structures as little as possible.

In the treatment of infected wounds we have used strict bed rest, heliotherapy and antiseptic dressings (Keith's dressing). In a few cases cod liver oil ointment has been employed, but it was not considered as valuable as Keith's dressing. Several very deep wounds have healed without operative interference, but in two cases we have resorted to excision with resuture.

V. TUBERCULOSIS OF THE SKELETAL SYSTEM

At Weston the orthopaedic service has taken a special interest in genito-urinary tuberculosis and for several years urine cultures have been planted at intervals of four months from every patient on the service. It has been found that 22%, or nearly one-quarter of all orthopaedic cases have had genito-urinary tuberculosis. (Among pulmonary patients the incidence is between 3 and 4%). It has also been demonstrated that the more skeletal lesions that are present in the body, the more likelihood there is of the development of renal and genital tuberculosis. Among patients with one bone or joint lesion the incidence is 18%, whereas it rises to 32% in those with multiple lesions in the skeletal system.

Among this series of 293 genito-urinary cases there have been 107 patients with 133 skeletal lesions. There were 67 spine cases, 21 hips, 17 knees and 28 other bone and joint lesions in the group.

VI. PULMONARY TUBERCULOSIS

Among the 293 renal and genital cases there were 133 who had active pulmonary tuberculosis, divided up as follows according to the standard classification. Minimal pulmonary tuberculosis 14; moderately advanced tuberculosis 45; far advanced tuberculosis 74.

Many other cases had a history of pleurisy or their chest films showed irregularities of the diaphragm due to pleural adhesions.

VII. DISSEMINATED AND MENINGEAL TUBERCULOSIS

Among the 293 cases in the series there have been 17 cases of tuberculous meningitis and 11 cases of acute miliary tuberculosis. It is to be expected that these generalized fatal forms of tuberculosis should occur frequently in association with renal and also with skeletal tuberculosis, as they are all of the same type of disease,

that is, they are late manifestations due to blood stream spread of organisms (similar to tertiary syphilis).

Evidences of widespread disease which has been successfully handled by the patient are sometimes seen, such as miliary nodules in the lungs, spleen, liver, etc.

VIII. DEATHS DUE TO TUBERCULOSIS

There have been 121 deaths among the 293 patients (a rate of 41%). As may be expected there were many deaths due to pulmonary tuberculosis. Fifty-four have died of this cause. Twenty-eight other deaths were due to miliary and meningeal tuberculosis. Actually, only 20 deaths could be attributed to renal tuberculosis — including both uræmia and perinephric abscess.

For the sake of comparison the series of 293 patients has been divided into 3 groups, depending on the major lesion causing the patient's admission—whether genito-urinary, skeletal or pulmonary tuberculosis. The death rates are as follows: 27% among those whose disease was primarily renal, 36% in the skeletal group and 65% in those whose major disease was pulmonary.

The first group (that in which the first symptoms were urological) is comparable to that which would present itself to the urologist in his office or on the hospital ward. Of 31 deaths in this group only 14 were due to renal tuberculosis; 5 died of pulmonary disease and 6 succumbed to meningitis or miliary tuberculosis. In addition there were two deaths each due to pneumonia and heart disease, and two post-operative deaths.

IX. CONCLUSIONS

Instead of drawing up a list of conclusions I should like to make a few observations which might be considered as corollaries to the paper.

Firstly, it is suggested that all cases of renal tuberculosis receive a course of bed rest both before and after operation. Even in genital tuberculosis or bilateral renal disease the same procedure is recommended. It should be kept in mind that tuberculosis is a systemic disease and therefore it requires treatment of the body as a whole. A number of months in hospital would have the two-fold benefit of providing the constitutional treatment that a systemic disease needs, and also of giving an opportunity to observe the patient and to recognize the presence of other tuberculous lesions, if there are

any. In addition, the life of the inoperable patient might be prolonged by retarding the spread of tuberculosis.

The pathologists will agree that far more tuberculous lesions are found at autopsy than were suspected in life. It would therefore appear insufficient treatment to admit a patient to hospital, promptly remove one focus of tuberculosis (namely an infected kidney or epididymis), and then allow him to return to work in a few weeks.

Secondly, it is urged that every case of genito-urinary tuberculosis have a chest film taken to see if there is any active disease in the lungs. If any suspicious area is discovered, re-examination at a subsequent date may be advisable, but that lies in the field of the chest consultant. The urologist will have done his duty to his patient by recommending the x-ray examination.

The figures given earlier in this paper have shown that when renal tuberculosis occurs in combination with other tuberculous conditions, the latter are often more important as far as the patient's expectancy of life is concerned. One has only to call to mind cases of bilateral renal tuberculosis or patients whose only remaining kidney is riddled with tuberculosis to realize that it is possible to live for many years with advanced renal tuberculosis, much longer than a pulmonary patient with a comparable amount of involvement.

Aside from miliary and meningeal tuberculosis, pulmonary disease is the most fatal form of tuberculosis, and early diagnosis spells the difference between a short course of treatment with return to active life and a protracted stay in hospital with little prospect of discharge.

One word more about chest examination. Physical examination of the lungs is not sufficient! By the time that abnormal physical signs in the lungs can be detected, pulmonary tuberculosis is at least moderately advanced and more probably far advanced. This means that the stethoscope is only useful in discovering disease in patients who have little better than a fifty-fifty chance of leaving sanatorium alive, let alone returning to a gainful occupation.

In a day when many apparently well people are being found by means of group surveys to be suffering from active tuberculosis of the lungs, the urologist would be lax in fulfilling his obligations to his patient if he neglected to advise him to have an x-ray film taken of his chest.

Case Reports

A CASE OF WATERHOUSE-FRIEDRICHSEN SYNDROME*

By E. Farber, M.D. and I. Salkin, M.D.

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Since Voelker¹ first recorded a case of acute bilateral adrenal haemorrhage in 1894, a total of 96 cases has been reported in the literature up to 1941.² The relative infrequency of this condition encourages us to report the following case.

C.P., a white male infant two years of age, was admitted to the Hamilton General Hospital at 6.30 a.m. on September 5, 1942. The mother stated that the child appeared perfectly well at 5.30 p.m. on the preceding day (September 4) but that at 8.00 p.m. it became suddenly ill, crying out, and vomiting. The vomiting continued at intervals throughout the night. The vomitus was not remarkable. At about 4.30 a.m., the child became blue and one hour later broke out in a rash. On admission this rash was described as haemorrhagic. The family history, past history and illnesses, and feeding history showed nothing important.

Physical examination revealed a very restless child, with cold clammy extremities, a temperature of 104.4° F., pulse of 136, and respirations 38 per minute. The skin was cyanotic and a generalized purpura was present. Examination of the head showed dilated pupils which did not react to light. The mucous membrane of the mouth and pharynx was cyanosed, as were the lips. The tonsils were present, but appeared normal. The neck was stiff, but no rigidity or head retraction was noted. The respirations were rapid and shallow, but the breath sounds were normal and no adventitious sounds were heard. The chest was of normal resonance throughout. The pulse was rapid and feeble. The heart was not enlarged to palpation; the sounds were regular in rhythm and no murmurs were heard. Palpation of the abdomen revealed a diffuse tenderness, the child crying out especially on deep pressure. Abdominal examination was otherwise negative. The extremities were flaccid but the reflexes were not tested.

The patient's condition rapidly deteriorated and he died at 7.50 a.m., about 12 hours after the onset of the illness and 1½ hours after admission. No blood counts or chemical tests were done. Oxygen, coramine and caffeine sodium benzoate were administered. The clinical diagnosis was acute fulminating meningitis, probably meningooccal in origin.

Necropsy was performed 4 hours after death. The body was that of a well-developed, well-nourished infant. Superficial examination revealed a generalized purplic rash. The purplic spots varied in size up to 6 mm. in diameter. The skin showed a blotchy cyanosis. The lips, ears, fingernails and toes were intensely cyanotic. Internal examination revealed extensive bilateral adrenal hemorrhages. Both adrenal glands were dark red in colour and resembled blood clot. No normal adrenal tissue could be seen with the naked eye. The shape of the glands, however, and their size and position were not altered. The lungs, liver and kidneys were slightly congested. The brain showed congestion, but no evidence of meningitis. The thymus gland and lymph nodes were normal in size and appearance. Microscopic examination corroborated the gross findings. With the exception of small islands of zona glomerulosa the entire adrenal gland was destroyed and replaced by red blood cells, many of which were degenerating. The adrenals contained large amounts of dark brown pigment.

Culture of a purplic spot from the arm revealed growth of Gram-negative diplococci, which on agglutination were found to be Type II meningoococci. Smears and cultures of cerebrospinal fluid showed a variety of organisms, probably contaminants. Meningococci were not present. Blood cultures were negative. Sections of the adrenal gland stained with Gram's stain revealed no organisms.

It has been suggested by many authors that this syndrome is more common than one is led to believe from reading the literature. This is probably due to the lack of familiarity with the condition. The majority of cases occur in infants under two years of age. The onset is very sudden, with headache, vomiting and malaise. Abdominal pain and diarrhoea may appear. Within a few hours the previously healthy child becomes acutely ill. Cyanosis appears within 8 to 12 hours and is either diffuse or blotchy in nature; the latter being more characteristic. Purpura is a characteristic feature. The extremities are usually cold and clammy, the pulse rapid and feeble and the respirations rapid and shallow. The temperature is usually high, the average being 104° F.² Neurological findings are variable. Neck rigidity, strabismus, convulsions, muscle flaccidity and other findings have been described. The duration of the illness is usually about 48 hours, although in the case reported above, this was under 12 hours. Bacteriological examination of blood and spinal fluid has revealed a variety of organisms, including meningoococci, pneumococci, staphylococci, streptococci and *H. influenzae*. According to Sacks³ and

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Lindsay *et al.*¹ the etiological agent in the majority of cases is the meningococcus. McLean and Caffey² advocate ante-mortem smear and culture of the purpuric spots as a means of determining the causative organism. The treatment at present advocated includes sulfonamide therapy, preferably sulfapyridine, adrenal cortical extract, or desoxycorticosterone, sodium chloride, epinephrine, intravenous glucose and blood transfusion. Up to 1941 no proved cases of recovery are on record.

We are indebted to Dr. W. J. Deadman for his valuable criticism and suggestions in the preparation of this paper.

REFERENCES

1. LINDSAY, J. W., RICE, E. C., SELINGER, M. A. AND ROBINS, L.: *Am. J. M. Sc.*, 1941, 201: 263.
2. MCLEAN, S. AND CAFFEY, J.: *Am. J. Dis. Child.*, 1931, 42: 1053.
3. SACKS, M. S.: *Ann. Int. Med.*, 1937, 10: 1105.

A CASE OF CAROTID SINUS THROMBOSIS

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The patient was a man of 52, in good health, working as a section man on the C.N.R.

On June 2, 1944, about 2 p.m. while at his usual occupation, he was jacking up the track. The jack slipped, throwing the crow-bar handle against the left side of his neck just below the angle of the jaw. This did not knock the man out or over. He rubbed his neck and went on with his work. There was not even a bruise on his neck.

About half an hour later, he became blind in the left eye, rubbed it for a little while and went on working. About an hour later, he noticed his right hand became cold and partially paralyzed. As his arm and hand became more paralyzed, he was brought into my office at 5.30 p.m. He walked in, although in getting out of the truck in front of the office door he had gone to the ground, showing that there must have been some weakness in his right leg. He was holding his right hand with his left, rubbing it because it was cold and throwing the right forearm about like a flail. The muscles of the shoulder girdle were still active. He talked rationally and clearly, and walked without any apparent difficulty. However, I sent him directly to the hospital. He walked out of my office and walked to bed in the hospital.

At 7.30 in the evening when I saw him again, he was quite bright, said he was hungry and ate without any difficulty. By this time, his right arm was almost paralyzed. His right leg was weak; the right knee reflex was plus, with a slightly positive Babinski. On protruding his tongue, it went to the right; his pupils were equal and reacted to light although he said his sight was a little dim in his left eye.

On June 3, his pulse was 60, blood pressure, 105/70. His right arm was almost completely paralyzed. He could whistle, puff out his cheeks, and spoke almost clearly. There was dim vision in the left eye but he was still eating and drinking comfortably. His spinal fluid was clear and there was no increased pressure.

On June 4, there was a complete right facial paralysis. He was semi-comatose but could be roused; pin-point pupils on both sides. He could not swallow properly and voided involuntarily. On June 5, he was quite unconscious, right arm and leg completely paralyzed, with rather sterterous breathing.

On June 6, he was unconscious, pulse was 80; temperature 102; blood pressure, 160/90; Cheyne Stokes breathing. At 6.00 p.m. he died. It was noticed prior to death, that his left arm and leg were spastic.

This man was presumed to have an internal capsular haemorrhage with extension thrombosis and cerebral oedema. An autopsy was obtained and showed no haemorrhage but an ischaemia of the left brain which was soft, almost of liquid putty; no haemorrhage could be found. On examination of the left carotid artery, there was a thrombus at the bifurcation of the external and internal. This was hard and firm, attached to the wall of the external carotid just at the bifurcation, cutting off the circulation through the internal carotid artery entirely.

Pathological notes (Dr. J. D. McInnes).—On opening the skull cap, the brain was found held by the dura under considerable pressure. Upon removing the meninges, that portion of the left cerebral hemisphere bounded posteriorly by the central sulcus and inferiorly by the lateral cerebral sulcus, was under a state of advanced semi-liquefactive ischaemic necrosis. There was no gross evidence of haemorrhage or thrombosis in the vessels supplying this area. The brain substance of this area collapsed when the support of the dura was removed. The remainder of the brain was oedematous but the consistency was good.

Because the mode of onset of symptoms was suggestive of thrombus and because no evidence of cerebral thrombosis was found, it was then decided to explore the area of his neck where trauma was said to have occurred. No discolouration of the skin or bruising of the tissues was evident. The sternomastoid muscle in that area was apparently normal. The carotid sheath near the bifurcation was swollen and a hard mass could be palpated within. Upon opening the sheath, the external carotid artery was found to be swollen for a distance of 3 cm. There was a small spot of cyanotic discolouration evident in the wall of the artery. Upon opening the vessel, an ante-mortem thrombus firmly adherent to the vessel wall was found commencing just inferior to the bifurcation and extending cephalad up the external carotid for a distance of about 3 cm. The orifice of the internal carotid was partly occluded by thrombus while just above this, the lumen was entirely occluded from pressure of the fusiform mass in the external carotid.

Pathologically, the picture was then determined as ischaemic necrosis of the anterior half of the left cerebral hemisphere due to occlusion of the left internal carotid artery.

Clinically, the picture became apparent in retrospect of a carotid hemiplegia and I might add that this possibility was considered ante mortem by Dr. Torrington.

Special Article

OSTEOARTHRITIS*

By Henry P. Wright, M.D., F.R.C.P.(C)

Montreal

Osteoarthritis is a chronic degenerative condition of the joints, occurring usually during or after middle age, which is characterized by deterioration and erosion of the cartilaginous surfaces of joints. Osteoarthritis represents an almost universal aging of cartilage and bones, just as arteriosclerosis does of arteries. The fact that the disease is relatively frequent in certain families suggests that some persons are born with susceptible joint structures. Arteriosclerosis is not necessarily related to this tendency. The source of the trouble and the signs are frequently associated with the weight-bearing joints, or found in joints subjected to

overuse. Osteophytes or spurs may mechanically, on account of their locality, cause marked symptoms. The condition in its etiology and symptomatology seems to be somewhat parallel with lameness in the old-time city cab horse.

PATHOLOGY

The earliest changes consist of degeneration of hyaline cartilage with small cracks in the articular cartilage which presumably result from the wear and tear of living. Coincident with the above, there often occurs proliferation of cartilage on the opposite joint surface. Proliferation of cartilage also occurs at the margin of the joints and is later converted into bone (osteophytes), e.g., Heberden's nodes. The synoviae are not usually involved. With thinning or erosion of cartilage, the exposed bone becomes eburnated or shiny. Secondary degenerative changes may also occur in other surrounding tissues. Portions of the joint may break off to form loose bodies in the joint.

In conclusion, therefore, it should be emphasized that degenerative arthritis (osteoarthritis) pathologically closely resembles traumatic arthritis, and perhaps is nothing more than generalized traumatic arthritis concomitant with advancing age and overuse. Certainly, slight trauma is often associated with the onset of the disturbance. A severe type of osteoarthritis in which not infrequently only the one joint is involved is malum coxae senilis which affects the head of the femur. Ankylosis does not, as a rule, occur except in the spine where exostoses usually fuse with one another.

SIGNS AND SYMPTOMS

Degenerative bone changes of some degree are present in over 90% of people who live beyond middle life. In the vast majority of cases, they cause no inconvenience, which, in some instances, no doubt is due to the fact that the "slowing-up process" has already commenced, therefore removing the exciting factor. As a rule, the onset is gradual and insidious with remissions, and the early symptoms vary. Local stiffness of one or more joints may be noticed in the morning or after prolonged fixation in one position. This is overcome after slight exercise but again is aggravated after moderate exercise and is usually quite troublesome towards the end of the day. There is often numbness in the fingers and hypersensitivity of the joints.

Common early signs are slight enlargement of the joints. These over-growths, when they occur in the terminal phalanges of the fingers, are called Heberden's nodes. They are exostoses and pathognomonic of the condition. Similar changes are sometimes seen in the proximal interphalangeal joints, and they must be distinguished from those of rheumatoid arthritis.

As time goes on, the condition gradually becomes aggravated and more disabling especially if the patient has continued to work and has

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not been under medical supervision. Great disability and pain often result if the spine, hips and knees are involved. However, ankylosis does not occur except in the spine where hypertrophic changes may cause root pains (radiculitis).

LABORATORY AND X-RAY FINDINGS

There are no characteristic clinical laboratory changes which can be determined in degenerative arthritis except that the basal metabolic rate is often lowered, perhaps on account of the general aging process, and roentgenological shadows of the bones are significant. In the early stages, there is slight marginal lipping or osteoporosis of the adjacent bone tissue. Later, increasing cartilage degeneration is indicated by narrowing of the joint space, with irregularity of the bone ends. Finally, exostoses and spur formation at the margins of bone become noticeable, and sometimes cyst-like cavities appear in the cancellous bone ends. Roentgenograms should always be taken of the hands because, early in the disease, they reveal changes in the fingers and are easy to interpret. Bony ankylosis never occurs except in the immovable joints of the spine, and in the sacroiliacs. In the knees, exostoses are prone to chip off and form calcified loose bodies (joint mice).

DIFFERENTIAL DIAGNOSIS

The diagnosis of this condition is usually not difficult, and, as a rule, confirmation follows roentgenological examination. It should be remembered that x-ray findings are sometimes not commensurate with symptoms, and associated fibrosis may be an important contributing factor. Also, there is no reason why a person suffering from degenerative arthritis should not develop rheumatoid arthritis, which combination is frequently referred to as "mixed arthritis". Osteoarthritis of the hip (*morbus coxae senilis*) must be distinguished from a slipped intervertebral disc. Paget's disease, neoplasms, osteitis fibrosa, chronic osteomyelitis and gout have all occasionally, for a time, been confused with osteoarthritis. The points of significance to remember are:¹ (1) Even without important symptoms, the history of a similar type of arthritis in the parents. (2) The age after 40, *i.e.*, at about the time of the menopause in women. (3) The frequent history of trauma and the presence of faulty body mechanics. (4) The insidious onset of stiffness and vague joint pains. (5) The well-being of the patient, without increased sedimentation rate, anaemia, fever or other illness. (6) The involvement of weight-bearing joints and the presence of typical Heberden's nodes. (7) The minute chondro-osseous growths seen in the roentgenograms.

TREATMENT

Degenerative arthritis is essentially an aging process and, consequently, each case requires individual attention from the geriatric point of view. Little can be done to change the hereditary tendency but sympathetic vigilance can anticipate difficulties and often guide patients into suitable activities. For example, amount of exercise and work, physical and psychological fatigue, dietary errors, faulty posture habits and adiposity, singly or in combination frequently cause constant aggravating trauma on the weight-bearing joints. Finally, the situation should be explained to the patient and assurance given regarding future progress. It is wise to state specifically that he or she is not the victim of the crippling and ankylosing type of arthritis, and that years of comparative comfort can be anticipated provided moderation in all things is enforced. When necessary, specific directions should be given and arrangements made for regular office consultations or visits for check-up. Sometimes once a month is advisable, and in other cases every three or six months is sufficient.

Weight reduction.—The age incidence of this disease is often associated with obesity, which acts as a constant chronic traumatizing agent. Consequently, dietetic management is important. Often, in elderly persons, it is not wise to change radically the diet, but the amount of food consumed should be reduced, with some limitation of fat and carbohydrate. Essential vitamins should always be supplied in adequate amounts.

Rest.—A certain amount of moderate exercise is important, but over-fatigue must, at all costs, be avoided. When possible, a rest-hour at midday is advisable. If this is not feasible, there should be a rest-hour before the evening meal.

Physical therapy.—Heat in some form is always indicated in osteoarthritis. This may be applied in various ways. Simple baking is the most generally employed method, and a small baking-lamp is a necessary part of the household equipment for patients suffering from this disability. Diathermy applied twice or three times a week for twenty to thirty minutes is comforting when ordinary measures do not suffice. General massage twice weekly should be advised when possible, especially in cases that are restricted from ordinary exercise such as walking, riding, and golf. Hydrotherapy, in the form of pool baths or swimming in temperate water, is often helpful. For the reasons mentioned above, it will be readily understood that holidays at various spas are sometimes most beneficial. *Orthopaedic appliances or surgery* should be considered when disability or discomfort persists.

Drugs.—Salicylates are the standby and should be used generously to allay pain; when necessary, phenobarbital gr. $\frac{1}{4}$, may be given

at the same time. When the basal metabolic rate is lowered, which quite commonly is found in so-called "menopausal" arthritis, thyroid gland should be tried, or, if indicated, one of the various oestrogenic preparations.

The prognosis for life is good, in fact, degenerative arthritis, by the very reason of its existence, restrains activities and is, therefore, often responsible for lengthening the age span. Arteriosclerosis is not necessarily present, but the author cannot refrain from closing with an apology and a modified quotation of an aphorism which is usually attributed to Osler:—"A man is as old as his arteries." And this also applies to his cartilage.

BIBLIOGRAPHY

1. A primer on arthritis. Prepared by Committee of the American Rheumatism Association, *J. Am. M. Ass.*, 1942, 119: 1089.
2. DAWSON, M. H.: Chronic Arthritis, Nelson's Loose-Leaf Medicine, N.Y., 1935.
3. COMROE, B. I.: Arthritis and Allied Conditions, Lea & Febiger, Phila., 1940.
4. STEINBROCKER, O.: Arthritis in Modern Practice, Saunders, Phila., 1941.
5. BAUER, W.: *New Eng. J. Med.*, 1939, 221: 524.
6. SHORT, C. L. AND BAUER, W.: *New Eng. J. Med.*, 1941, 225: 145.

The Drummond Medical Building.

1. Ease of application, preferably by means of a firm gauze swab.

2. Free and smooth flow to cover evenly with a thin film the surface of both skin and metal plate.

3. Adhesive qualities sufficient for the purpose but not so strongly adhesive as to render difficult the removal of the cut graft from the metal plate.

4. Affinity for the metal rather than for the graft, or rather, a greater affinity for the metal than for the skin surface.

5. Neither irritating nor caustic to the skin or tissues.

6. Sterile or antiseptic or at least bacteriostatic.

7. Of a uniform thin consistency or readily diluted and thinned down to the desired consistency.

8. Readily cleansed from skin surfaces and instruments.

9. Non-corrosive to instruments.

10. Should set or become "tacky" in a reasonably short time.

With the advent of war priorities and difficulties of international shipment of anything suggestive of "rubber", the Canadian Industries Limited was approached and the problem placed before them. By trial and error over a period of nearly two years a liquid was finally evolved which belongs to the pyroxylin or nitrocellulose family of adhesives. This has given outstanding satisfaction and fulfilled the qualifying essentials enumerated above.

Bacteriological studies were conducted at the laboratories of the Montreal General Hospital and the cement declared safe for clinical use. It was put into clinical use at the Montreal General and Saint Mary's Hospitals, where several advantages over previously used media soon became obvious.

The outstanding advantage lies in the fact that the cement has a greater affinity for metal than it has for skin. Upon removing the graft from the metal drum or sheet the adhesive appears to cling to the metal, leaving the skin surface of the graft clean and free. Many of the previously used cements cling partially to the skin surface and in removing, especially the thinner grafts, skin surfaces would often become hopelessly tangled and stuck to skin surfaces.

Methyl acetate was suggested by Canadian Industries Limited as a diluent and cleanser and has been entirely satisfactory.

The cement is of a honey colour and of uniform, thin, syrupy consistency. It does not separate or settle out on standing but tends to thicken with age or exposure due to evaporation of the diluent. This is readily corrected in the operating room by the addition of methyl acetate. It spreads evenly on the drum and skin surface with a snugly rolled gauze tampon and is "tacky" and ready for cutting in one to three minutes.

Clinical and Laboratory Notes

A NEW CEMENT FOR USE IN CUTTING SKIN GRAFTS

By John Gerrie, M.D., C.M.

Montreal

The outstanding work of Padgett¹ on skin grafting and the design and construction of the dermatome by Padgett and Hood in 1939 introduced the "adhesive" method of cutting skin grafts in contradistinction to the older "tension" or "traction" methods.

Modifications of the dermatome have been suggested, mainly for the purpose of producing a less costly or mechanically more sound type of equipment, but in all, the adhesive principle remains the same, *viz.*: an adhesive liquid is applied to the donor surface and to the metal drum or plate by means of which the skin is lifted and a graft of known calibrated thickness and desired size is cut. The graft is then removed from the metal drum and placed in position upon the recipient surface.

Different types of "cement" have been available, ranging from ordinary glue to rubber cements. None of them have proved to be without some practical disadvantages.

From my experience, working with the Padgett dermatome and also with the Caltagirone equipment, the conclusion has been reached that the ideal cement should possess the following qualities:

CONCLUSIONS

1. An adhesive cement is necessary in the presently popular "adhesive" methods of cutting skin grafts with the Padgett dermatome and the Caltagirone skin grafting equipment.
2. A cement of the nitrocellulose group has been developed and shows certain advantages.
3. The most outstanding of these advantages is that the cement has a greater affinity for

metal than for skin and the skin is stripped away cement free, leaving the cement on the metal.

4. The cement is not irritant, can be spread with gauze to an even, fine film and quickly becomes "tacky".

REFERENCE

1. PADGETT, E. C.: *Surg., Gyn. & Obst.*, 1939, 69: 779.
1414 Drummond St.

Editorial

**THE CANADIAN MEDICAL
PROCUREMENT AND ASSIGNMENT
BOARD**

EVENTS move so quickly nowadays, and there are so many of them, that frequently it is necessary to review the history of developments even of short duration. This applies to an organization as recent in formation as the Canadian Medical Procurement and Assignment Board. There are signs that the function of this Board is not entirely clear in everybody's mind, with the result that it is blamed for conditions for which it bears no responsibility.

The Canadian Medical Procurement and Assignment Board was established by an Order-in-Council in July 1942. The Minister of National Defence had reported on the urgent need for additional medical officers for war establishments. In dealing with this problem he had had to depend largely on a survey of available civilian physicians which had been carried out independently by the Canadian Medical Association. This survey, however, only provided the bare facts of the number of men available in the country. It was necessary that there should be some machinery for the practical application of the information; and it was equally necessary that the needs of the civilian population should be kept in mind, so that the country generally would not be deprived of essential medical care by wholesale drafting of practitioners into military service.

The Procurement and Assignment Board was accordingly formed. It consisted of eleven members: the Medical Directors of the Navy, Army, and Air Force; the Director of the Medical Services of the Department of Pensions and National Health; the Medical Director of National War Services,

and a representative from the National Selective Services; and five members from the Canadian Medical Association. The secretary of the Board also was chosen from the last named group.

The duties of the Board were laid down as follows:

- (a) To tabulate, analyze and utilize the results of the survey made by the Canadian Medical Association of physicians registered in Canada with a view to determining the number available for appointment to the Armed Forces of Canada.
- (b) To allocate as a result of information obtained in the survey medical officers in the proper proportions for appointment to the three branches of the Armed Forces of Canada.
- (c) To consider carefully in relation to the available supply of physicians for appointment to the Armed Forces, the requirement of civilian institutions, public health departments, medical schools, war industries and communities in order that there shall be no impairment of essential public health services.
- (d) To undertake the responsibility for investigating conditions at first hand regarding civilian needs and the possibility of making such arrangements as are possible and expedient where there is an apparent conflict between military and civilian needs.
- (e) To make further surveys and investigations with respect to the availability of physicians not reached by the survey who are eligible for appointment, in order that adequate provision may be made for the future requirements of the Armed Forces of Canada.

The Board had its first meeting in July, 1942, and from then on has been constantly occupied with its duties. As we now know, the work of procuring the needed medical men for the Armed Forces was carried through with complete success, together with a most valuable survey of the distribution of medical personnel in the country.

It may be that the title of the Board implies powers which it does not possess. It has no powers of compulsion, except of a very indirect nature, and the allocation of the men depends on the demands of the various services rather than on any independent assignment by the Board. In other words, it merely finds the men and arranges

for their allotment in accordance with the needs of the services.

There have been cases in which individuals have felt that their special training has not received the consideration it deserves, and they have looked to the Board to adjust their difficulty. But once a medical officer has been assigned to one or other service, his disposal passes out of the hands of the Board. It becomes a matter for the individual service itself.

Editorial Comments

The Sulfa Derivatives in the Treatment of Tuberculosis

The hope of discovering a specific for the treatment of tuberculosis has been given fresh impetus by the development of the sulfonamides. Experimentally it has been shown that the tubercle bacillus is amenable to chemotherapy in spite of its morphological peculiarities; sulfanilamide, for instance was shown to have definite inhibitory effects on the development of tuberculosis in guinea pigs. But clinically it was quite ineffectual. Then came later derivatives, notably diastone and promizole. These gave highly promising results in animal tuberculosis, and have led to extended clinical trials. There have been reports on small groups of patients, but so far nothing conclusive has been announced. In the first place the application of laboratory results in animal tuberculosis to the treatment of human tuberculosis has to be made with extreme caution: it was found for example that guinea pigs could tolerate larger amounts of promin by mouth than can man. And certainly it has not been possible to reproduce in man the inhibitory effects on the disease which are so encouraging in the experimental phases.

But, short of having a clearcut specific effect on tuberculosis, which not even the experimental results indicate, great difficulties lie in appraising the effects of these sulfa derivatives. The first and all important factor is that of proper control management. This means not only the comparison of treated with untreated cases, but the selection of the treated cases with regard to the degree and location of infection, the virulence of the organism, the physical characteristics and the psychological attitude. Age, sex, race and associated disease of the patient must also all be considered. Even those least experienced in tuberculosis work realize the difficulty of reducing these factors to a common denominator, and the necessity therefore arises that there should be large series of cases. Hence

small institutions will be handicapped in such investigations.

Then, the dosage of the drug must be considered, as well as the method of administration. Finally, and probably one of the most important features, there is the duration of the treatment to be considered. Tuberculosis is naturally a slow-healing process; the effect of these drugs is admittedly not rapid, and if their value is to be properly assessed, sufficient time must be allowed, both for the immediate arrest of the disease and as regards the possibility of recurrence.

These prerequisites are well dealt with by Hinshaw and Feldman (*Am. Rev. Tuberc.*, 1944, 50: 202), and are a timely warning against too hasty trial, as well as unwarranted conclusions either for or against these new remedies.

Leucocyte Counting

A recent publication by Professor Theo. R. Waugh,* emphasizes the importance of thinking in terms of the actual number of each type of white blood cell, instead of differential percentage figures. The detailed haemogram is replacing the older, simpler estimation of the number of red and white cells and the haemoglobin. This is as it should be, since the more complete analysis of the morphological elements of the blood not only gives more exact knowledge of its condition, but also reveals the anatomical and functional state of the whole blood-forming mechanism.

The determination of the actual number of each type of leucocyte has been found to be one of the most informative parts of such complete studies of the blood, but since it is a tedious procedure, an attempt has been made to simplify the work by the construction of a series of tables from which the desired figures may be obtained. These tables are prefaced by a short chapter on the white cells, the methods of counting and how to use the tables. The book should be of assistance in the work of white blood cell enumeration.

The Manufacture of Penicillin

Regulations have been laid down under the Food and Drugs Act, governing the licensing of manufacturers of penicillin, fixing standards of quality and potency and defining official methods of testing it. These regulations have followed on recommendations submitted by the Canadian Committee on Pharmacopœia Standards.

The manufacture of penicillin now requires a valid license from the Deputy Minister of Pensions and National Health which will be

* White Blood Cell Differential Tables, D. Appleton-Century, New York, 1943.

issued only in cases in which the Deputy Minister is satisfied that such an establishment is capable of producing penicillin of safe and dependable quality. The products of any such establishment are to be subject to careful methods of testing for pyrogens, potency and sterility, and are to be packaged in approved forms of ampoules or sealed vials.

Medical Economics

DOCTORS OF HEALTH—OR DOCTORS OF DISEASE?

[The following comments come from the "Royal Canadian Navy Medical News-Letter", of July 31, 1944. They strike a warning note which is worthy of consideration.—EDITOR.]

Can it really be that the public believes we physicians are more interested in "tinkering with disease" than building "positive health"? How unfortunate it would be if we were to become relegated to the status of "menders" instead of "makers"!

There are plenty of laymen who require amazingly little persuasion to accept the rôle of community health spokesmen. The mantle of medical prophecy may fit them loosely but it is not quite large enough to cloak their incompetence for the rôle. Among these oracles are the schoolmasters, the chemists, the engineers and the sociologists. These folk are invaluable in furthering social medicine but the leadership should come from our ranks.

The fact that the stimulus for an improved health policy has been increasingly supplied by the laity is no one's fault but our own. We physicians have allowed ourselves to become so preoccupied with illness that we have failed in some measure to give enthusiastic encouragement to any campaigns for national fitness. We have not been sufficiently convinced that health is worth studying for its own sake.

People are still buying an apple a day to keep the doctor away instead of looking to him in confidence as a designer for better health. The job of building bodies and minds has gradually fallen into the hands of the gymnasts and dominies. We contribute precious little to their instruction. Not even in the colleges of education and normal schools is there a qualified physician on the lecturing staff.

The engineering profession is certainly making its mark in the field of health. They well deserve our tribute as ethical colleagues. Our safe water systems, our sewage disposal plants, our pasteurizing equipment, our industrial safety devices, our housing innovations, and many of our food processing developments are the result of their training and skill. In addition, they have revolutionized malaria control, speeded up the production of penicillin and made effective temperature stabilization a

reality. By continuing to use the findings of medical scientists they will take an increasing part in planning for better health.

Sociologists and mental hygienists are also interested in producing healthier citizens. No real progress in health evolution can be made without a concurrent emphasis on better thinking and improved environment. Crime, delinquency, and instability are more or less directly related to poverty, ignorance, ill health and un-supervised breeding. A health program to these people includes better nutrition, adequate recreational facilities, decent housing and employment security. People must be encouraged to build up their own emergency and old age economic protection. This, the sociologists assert, can be done by education and assured employment.

Physicians in general will have to take their share in building this health expansion program. We shall have to come off our isolationist pedestal and deal with a health-conscious public. If we don't, the Junior League will do it instead and probably not as well. There is possibly no other group as well-informed professionally and as ill-informed socially as ourselves. Too long we have dubbed those interested in social health as mere "dabblers in uplift". Our attitude is often as cynical as the man who prefers his bitters without gin.

No honest person has suggested that the failure of physicians to take an active part in disease prevention is due to their financial interest in the maladies of their patients. That, at least, is a comfort. No, it's rather a lack of community awareness which has kept us out of public health affairs.

Many of our medical officers will be absorbed into the field of disease prevention and social medicine. Such a promising field of usefulness should prove attractive to them. One hears that the salary levels in this branch will be adequate. The course in public health will probably provide in its curriculum something more specific on health education. In the meantime, attention is directed to an article in *The Lancet* of July 1, 1944, by Professor James Mackintosh on "Teaching and practice in preventive medicine".

J.L.L.

NOW FOR THE SEVENTH. As V-Day approaches, more and more money is needed. Our boys "over there" must be completely equipped and kept supplied with all the equipment required to finish the job. They must not only be backed to the limit but must also know that those on the home front are behind them 100%. It's an all-out drive for money to support an all-out drive for final victory. Invest in Victory—Buy Victory Bonds.

Retrospect

PYOGENIC INFECTIONS OF THE URINARY TRACT

(An Analysis of 1,000 Cases)

By Surgeon-Lieutenant Commander
John T. MacLean, R.C.N.V.R.

Consultant Urologist, Urological Special Treatment Centre, St. Anne's Hospital, St. Anne de Bellevue

Pyogenic infection of the urinary tract is not uncommon in the Armed Services, nor in civil life. Nevertheless, the conflicting views on treatment and the fact that the prognosis may vary so greatly, have led to a great deal of confusion in thinking. The work of various investigators in the study of renal pathology will be briefly reviewed in an effort to clarify the problem, and a detailed analysis of 1,000 cases of pyogenic infection of the urinary tract presented. This latter study was carried out in the Department of Urology of the Yale School of Medicine and the New Haven Hospital.

I believe it is of value to define what one means by the term "pyogenic infection".

The group of kidney disorders which is due to the action of bacterial toxins on the kidney, and is characterized pathologically in the acute stage by proliferation of the cellular elements in the glomerulus, and later by degeneration of the three main constituents of the kidney, and finally by replacement fibrosis, is excluded by applying to that group the descriptive term diffuse glomerulo-nephritis. That leaves then, the group of infections which are due to invasion of the kidney the ureter, or the bladder, by the organism itself, rather than by a toxin, as in the previous group. Here, the organism acts in an entirely different manner from the way the toxin acts.

Goldblatt *et al.*¹³ in a series of ingenious experiments reduced the blood supply to the kidney by constricting the main renal artery. Renal ischaemia resulted and hypertension developed. Various investigators then went on to show that every possible nervous connection between this type of ischaemic kidney and the nervous system could be destroyed without any effect on the hypertension. These experiments included denervation of the renal pedicle,²¹ section of the splanchnic nerves and excision of the lower four thoracic sympathetic ganglia,¹⁴ section of the anterior nerve roots from the second dorsal to the second lumbar inclusive,¹⁵ and excision of the entire sympathetic nervous system of the thorax and abdomen including cardiac denervation.¹² It therefore seemed reasonable to suppose that a chemical substance having a pressor

action was being produced in the ischaemic kidney.

Subsequent investigation led to the extraction of a substance known as renin from normal kidneys.²⁷ This substance has a powerful and prolonged pressor action, more marked in nephrectomized than in normal animals. It was found that the ischaemic kidneys of hypertensive dogs contain more renin than normal kidneys.¹⁷ Renin produces a hypertension similar to that of primary hypertension in man. Attempts to purify renin from renal extracts deprived it of its pressor action;²³ this action was fully restored by the addition of a protein fraction from normal blood (renin-activator). The action of renin on renin activator produces angitomin, which has a powerful pressor action. It is thought that the ischaemic kidney tissue produces this pressor substance in excess, or else a similar substance which has a more marked pressor effect. The formation of pressor amines in the kidney has been studied by Bing and Zucker,^{3, 4} and others.

By injecting increasing amounts of renin into animals it is possible to reach a point where renin will no longer cause a rise in blood pressure. This, plus other considerations led to the suggestion that an anti-pressor substance might be contained in normal kidney tissue. Such a substance was extracted by Grollman, Williams and Harrison¹⁶ and by Page and his co-workers.²⁴

In other experiments, Page²² produced a cellophane perinephritis by the loose application of a layer of cellophane about the kidney. Cellophane causes a marked tissue reaction so that within a few weeks the kidney becomes encased in fibrous tissue. After an interval of 3 to 5 weeks the arterial blood pressure increases markedly, continues at this elevation for a short time, and then levels off at a fairly constant elevated level. The parallel between cellophane perinephritis and clinical perinephritis appeared most striking, but this was found not to be so by Braasch and Wood,⁶ who in a study of 70 cases of clinical perinephritis found some correlation between hypertension and perinephritis in only 4.28% of the group. This was less than half the incidence of hypertension existing in a random sample of patients under 50 years of age who registered at their clinic.

Weiss and Parker³² studied the broad problem of pyelonephritis by the painstaking technique of microscopic section of the infected kidneys. They have made a great contribution to our knowledge by pointing out that pyelitis almost never exists without concomitant pyelonephritis. In 99% of the cases they found morphological changes in the kidney characteristic of the stage of the disease. In chronic and healed pyelonephritis, the main morphological characteristics consist of inflammatory reaction of the interstitial tissues; colloid casts in the tubules, which are lined with atrophic epithelium; periglomerular fibrosis; and evidence

of infection or inflammation within the tubules. Pyelonephritis can therefore be differentiated from acute interstitial nephritis, glomerulonephritis, etc.

The blood vessels also share the brunt of the attack, particularly during the chronic and the healed stages. Acute arteritis or arteriolitis resembling lesions in periarteritis nodosa, phlebitis, and hyperplastic arteriosclerosis are the types of lesions which are related to the renal infection. Hypertension was often associated with the pyelonephritis. A definite relationship was found between the severity and diffuseness of the vascular lesions on the one hand, and arterial hypertension on the other hand. Cases with severe hypertension had advanced hyperplastic arteriosclerosis, a certain type of productive endarteritis, and necrotizing arteriolitis. Pyelonephritis which was formerly regarded only as an inconvenience, now became a disease which threatened to shorten life by a decade or more.

With this background of experimental and clinical work, the interest in pyelonephritis and in hypertension took a strong upward surge. Renal surgery did its utmost to keep pace. Numerous papers appeared reporting the relationship between chronic pyelonephritis and hypertension; unilateral renal disease and hypertension; nephrectomy for the relief of hypertension; and the surgical treatment of hypertension by sympathectomy.^{1, 2, 5, 7, 9, 10, 11, 18, 20, 25, 29, 33} A critical analysis of the surgical pathological literature on the relationship between chronic pyelonephritis and hypertension is neatly expressed by Smith, Goldring, and Chasis.³¹ For the purpose of analysis they divided the papers up into various groups. In the first group (25 papers with a total of 76 cases), in which a reduction of blood pressure had been reputed to follow unilateral nephrectomy, these authors were able to accept only 7 of the 76 cases as having had a favourable result. They do not state what criteria they used in the analysis, but point out that they will do so in a subsequent publication. The second category deals with instances of hypertension supposedly arising from mechanical compression of the renal circulation or the renal parenchyma. They found only 10 cases in the literature, but were able to accept only four cases as demonstrating the applicability of the Goldblatt experiment to man. In the third category of papers claiming that there is an abnormally high incidence of urological disease in hypertensive subjects, they analyzed the paper of Schroeder and Steele³⁰ who reported an incidence of 113 urological anomalies out of 250 living patients. Smith *et al.* are able to accept only 60 cases as having apparent urological fault, and they point out that making a diagnosis largely upon abnormal pyelograms is hazardous. The fourth category deals with papers that report the incidence of

hypertension in pyelonephritis. They analyze the paper of Pearman, Thompson and Allen²⁶ who found that in 500 cases of pyelonephritis the incidence of hypertension was only 9%—a figure that compares favourably with goitre without hyperthyroidism (10%) and with gall-bladder disease. The last category of paper examined deals with the incidence of hypertension in patients with demonstrated unilateral renal disease. These authors state that the data they analyzed forms an impressive statistical demonstration that unilateral renal disease and surgical uropathology do not predispose to hypertension. They conclude that unilateral renal disease is rarely a cause of hypertension in man.

It is obvious that if we are to diagnose pyelonephritis correctly, we must set up certain criteria of diagnosis. The first and essential fact is that pyogenic organisms must be present. Failure to examine the specimen for organisms is one of the commonest causes of error in diagnosis. It should be fundamental knowledge that the normal urine from a normal bladder is one of the cleanest of body fluids, and that, above all, it is free from bacteria. If one is to examine urine for organisms a freshly voided specimen of urine should be collected in a sterile tube or bottle, and the centrifuged sediment stained and examined for organisms soon thereafter. If organisms are found in a freshly examined specimen collected in a sterile container, it may be accepted that they came from the patient. The microscopic examination is of equal importance. It is frequently advisable for the man handling the case to do the microscopic examination himself, or at least check it. The compensation for this task is that what is seen, gives the vision of what lies ahead. As will be demonstrated shortly, the prognosis depends to a very large extent upon the etiology.

Some excellent papers have been written on the results of detailed studies of the bacteriology of the urine.²⁸ From a clinical point of view an elaborate process of staining is undesirable. A Gram stain is sufficient to identify a bacillary infection from a staphylococcal, streptococcal, or mixed infection, and in 90% of cases this is all one needs to know. If the infection is one of the rarer types which does not respond to treatment, then a culture can be done to identify the organism. In the series of cases studied the bacteriology on culture agreed with the findings on stained smears in 67 to 73% of the cases in the different groups. The process of examining stained smears of urinary sediment can be further simplified by doing a methylene blue stain instead of a Gram stain, since only 2% of the infections are caused by Gram-positive organisms.

In the 1,000 cases studied the infecting organisms were, in the order of frequency:

Bacillus coli	42%	Roughly 70% due to
Other Gram-negative bacilli..	30%	Gram-negative bacilli
Staphylococci	12%	
Mixed organisms	8%	20%
Other types:		
Gram-positive bacilli....		
Streptococci		
Gonococci		
Diphtheroids		
	8%	

The infection may reach the kidney by the blood stream, by lymphatic spread, or by regurgitation up the ureter. How it gets there is chiefly of academic interest. The fact remains that the kidney is attacked, the function is impaired, and the kidney is permanently damaged.

In this study, many of the cases could be followed for a period of over 20 years. The cases included the private ambulant patients of Dr. Clyde L. Deming, the outdoor clinic patients, and all the hospital admissions, thus avoiding as much as possible "selective sampling". The cases were found to fall into certain natural groups by virtue of the fact that the etiology, pathology, and, especially the prognosis differed so greatly in the different groups. Once a case is diagnosed and it is found in what group it belongs, then one can predict with a high degree of accuracy what the prognosis will be for the future of that case. These natural groups were as follows:

	Number of cases
1. Under 15 years of age.....	69
2. Cases associated with pregnancy.....	68
3. Associated with overgrowth of the prostate.....	35
4. Associated with stricture of the urethra in the female	78
5. Fractured pelvis, ruptured bladder and cord bladder	4
6. The group complicated by renal calculi.....	43
7. Cystitis alone	251
8. Pyelitis, or pyelonephritis, with or without cystitis	452
	<hr/>
	1,000

The group under 15 years of age.—There were 57 cases studied in this group, showing 69 infections. Pyelonephritis and cystitis occurred together in 54 of the infections; cystitis occurred alone in 15. The average age was 8.32 years, with a range in age from one week to 15 years. The ratio of females to males was 2:1. The lesion was on the right side in 25%, left side 25%, and bilateral in 50%; 64% of the patients presented themselves for examination on an average of 17 days after the onset of symptoms. The remaining 36% appeared for examination on an average of 2 years after the onset of symptoms. The response to treatment varied directly as the length of time symptoms existed before treatment was started; 24% of the patients had recurrent attacks of infection varying from 1 to 10 times before their first consultation. That is one of the three important features of pyelonephritis; it is a disease characterized by recurrent attacks. 26% of the cases

had an acute upper respiratory infection immediately preceding the urinary infection. This is the second important fact. The third important fact is that 20% of these children had a congenital lesion in the urinary tract, as follows: aberrant renal vessel 2, stricture of the urethra 4, stricture of urethral meatus 1, valves of posterior urethra 2, uretero-vesical valve bilateral 1, double kidney and double ureter (left) 1.

Seventeen of these children, or 30%, had a major operative procedure such as a nephrectomy, nephrostomy, plastic operation on the renal pelvis, etc., and 3 were operated upon with a diagnosis of acute appendicitis before being referred for consultation. The differential diagnosis between pyelonephritis and acute appendicitis is very often difficult, but if one observes the rules of urine examination previously described, the differential diagnosis is often greatly simplified.

Of the 17 operative cases, the 3 appendectomies recovered in 10 days' time. There were 3 deaths in the group, and 10 cures. The cures averaged 3½ months after treatment was started. There was 1 patient who still had a nephrostomy tube at the end of 1 year, and one who could not be traced.

Of the remaining non-operative cases, in those treated by the older methods of urotropin, sodium bicarbonate, etc., 85% were cured in just under 5 weeks of treatment. In those treated by sulfonamides and mandelic acid, 92% were cured in an average of 10 days.

There were 15 cases that had cystitis alone; 2 after suprapubic cystotomy for hypospadias. Eight were treated with urotropin and, of these, five were cured in 28 days. Two were treated with mandelic acid and both were cured in 12 days. Three were lost track of. In all cases, the term "cured" is used when referring to a patient who is asymptomatic, and the urine does not show any pus cells or organisms on repeated microscopic examination. The term "improved" is used to indicate a patient who is entirely asymptomatic, but whose urine shows a few organisms on microscopic examination.

Blood pressure studies over a 3 to 10 years' period could be carried out in only 18 of these cases. The figures of Judson and Nickolson for blood pressure in children were used as values for normal. Five cases had hypertension when they first reported for treatment. Three others developed hypertension 1 to 3 years later, giving a total incidence of 44% in the 18 cases—all of whom were under 15 years of age. The group however was too small from which to draw any reliable conclusions.

The group of infections associated with pregnancy.—This group has been reported separately.¹⁹ It was found that the incidence of pyelonephritis in pregnancy diminishes with each successive pregnancy. It was also found that the incidence of infection increases each

month, with the maximum occurrence at the fifth and sixth month of pregnancy. This parallels the incidence of occurrence of dilatation of the ureter. Both parallel exactly the increased excretion of oestrin and corpus luteum hormone by the placenta during pregnancy.

The colon group of bacillus was found to be the commonest infecting organism, and staphylococci the next commonest.

Pyogenic infection of the urinary tract was not considered to be an indication *per se* for abortion. No association was found between the month of pregnancy at which infection occurred and the ability to reach term, provided that conservative treatment was used.

TABLE I.

	No. of cases	%	Living baby		Dead baby	
			No.	%	No.	%
Abortions.....	7	12.3	*			
Deaths.....	1	1.7				
Normal delivery...	34	60.7	34	70.8		
Cæsarean section..	2	3.5	2	4.1		
Medical induction and delivery....	85					
	12	21.4	7	14.7	5	10.4
	56	99.6	43	89.6	5	10.4

*48 babies equals 100% of possible.

(Reproduced from *J. Urol.* 1943, 49: 236).

By using conservative treatment 85% of the patients were carried to term or until the fetus became viable, and of these, 90% were delivered of living babies. Irrespective of the month of onset of the infection, therapy was given until the patient was either "cured" or delivered. Only 25% of the cases were "cured" at term, yet within 2 weeks of emptying the uterus, 90% were asymptomatic and free of infection. The incidence of hypertension in this group of infections associated with pregnancy was 27%.

Pyelonephritis or cystitis associated with overgrowth of the prostate.—This group will be mentioned only briefly. It is a fact that as soon as the bladder is opened and a tube put in, it becomes infected. I believe that every patient has a cystitis after a prostatectomy. One of the commonest mistakes made is in not treating it as such. One sees far too many cases of prostatectomy in which the patient carries his infection postoperatively over a prolonged period of time, and has far worse urinary symptoms than he ever did have from his prostatic hypertrophy. Eventually when the bladder neck becomes completely fibrosed he returns, only to discover that he has a "contracture of the bladder neck, postoperative". This can nearly always be prevented by getting rid of the urinary infection after the operation. This takes about two to three months of constant postoperative care; bladder dilatations and lavage once a week; and chemotherapy. The chemotherapeutic agent should be changed every 10 days.

The infections associated with fractured pelvis, ruptured bladder, and cord bladder.—This group obviously presents an entirely different picture to any of the other groups. At the best of times the treatment is very difficult. Fortunately, they represent a small group. Here the old controversy between tidal drainage and suprapubic cystostomy comes into its own. With constant attention, adequate drainage, and chemotherapy, the prognosis is often surprisingly good. What makes it difficult is the fact that the patient may require drainage for a year, or even for life.

The cases of infection associated with stricture of the urethra in the female.—There were 78 cases studied showing 79 infections. Stricture of the urethra and cystitis occurred in 59; stricture of the urethra and pyelonephritis in 20. The infection was on the right side in 10, left side in 3, and bilateral in 7. The mean age was 38.2 years. The range in age was 22 to 75 years.

Complications were present in 25% of the cases. The complications encountered were diabetes mellitus, 5; tertiary syphilis, 2; lymphogranuloma inguinale, 1; double kidney and double ureter (left), 1; atrophic kidney (right), 1; cervicitis, 1; fibroid, 1; cystocele, 7; calculus in bladder, 1. The commonest types of organism encountered were, in the order of frequency, *B. coli*, other Gram-negative bacilli, staphylococci, and streptococci. Twelve per cent of the patients had a markedly reduced phenol-sulphonphthalein test.

All of the patients were treated by dilatation of the urethra and chemotherapy. They had on an average, 4 dilatations at weekly or biweekly intervals. The additional therapy given was as shown in Table II.

TABLE II.
ADDITIONAL THERAPY

	No. cases	Average duration therapy	End result			
			Cured	Infection	Unknown	Deaths
Urotropin, niazo, or methylene blue.....	51		46	5		
Mandelic acid...	17		17			
<i>Operative:</i>						
Hysterectomy..	1		1			
Repair cystocele	2		2			
*Nephrectomy, right.....	1		1			
Indwelling cath.....	1	2 mos.	1			
No special treatment except dilatation.....	1	3 weeks				1
Unknown.....	5				5	
	79		68	5	5	1
Percentage....			86.0	6.3	6.3	1.4

*Nephrectomy, right, was for an aplastic right kidney which continued to harbour infection.

There were 86% "cured" in an average of 4 weeks of treatment. The infection in these cases was primarily due to stricture of the urethra.

Infections complicated by renal calculi.—There were 43 cases showing 63 infections. The average age in years was 43.2 years. The range was from 18 to 65 years of age. The incidence was divided equally between the two sides. The commonest infecting organisms were *B. coli*, 16; other Gram-negative bacilli, 15; mixed organisms, 14; staphylococci, 10; *B. proteus*, 5; unknown, 3; 30 cases had only one attack of infection associated with the calculus; 13 cases had recurrent attacks of infection plus calculus, thus showing a total of 33 infections in the 13 cases.

The treatment given was as shown in Table III. Chemotherapy consisted of various urinary antiseptics; in the earlier cases, urotropin, sodium bicarbonate, niazo, etc., and in the later cases mandelic acid or sulfonamide therapy or

TABLE III.
TREATMENT IN CASES WITH CALCULUS

	30 cases with single infection	13 cases with 33 infections	Total
Nephrectomy.....	13	4	17
Nephrolithotomy			
—unilateral.....	3	4	7
—bilateral.....	0	2	2
Pyelolithotomy.....	3	6	9
Ureterolithotomy	4	2	6
Dilatation of ureters.	2	8	10
Passed calculus			
spontaneously.....	2	2	4
Chemotherapy only..	1	0	1
Refused treatment...	2	0	2
No special treatment.	0	5	5
	30	33	63

both, depending on the bacteriology of the infection.

The end result after an adequate period of observation showed 21 cases "cured" (50%), 10 improved (approximately 25%), 2 not improved, 2 deaths, 7 unknown results, and 1 who refused treatment.

It was found that it was impossible to get rid of the infection in the kidney until the calculus had been removed. Only 50% of the cases could be considered "cured"; 30% of the cases showed recurrence of the infection. The most striking fact is that 40% of all the cases eventually had to have a nephrectomy. It is obvious that the prognosis in this group is entirely different from that of any of the other groups.

Cystitis.—In the group of infections limited to the bladder there were 251 cases studied; 215 female and 36 male, a ratio of 7:1. The average age was 44.6 years and the range in years was 16 to 84. The commonest infecting organism was again *B. coli*; other organisms occurred in the same order of frequency as in the other groups. The bacteriological findings on culture agreed with the microscopic findings on stained smears in 69% of the cases.

The infection was due to postoperative catheterization in 9 cases, and due to excessive coitus in 11 cases.

Treatment in all cases consisted of chemotherapy, using standard urinary antiseptics such as urotropin, sodium bicarbonate, methylene blue, niazo, etc., and lately mandelic acid and sulfonamide therapy; 73% of the patients were "cured" and 93% became asymptomatic in a period of 2 to 3 weeks.

Blood pressure studies over a long period of time were available in only 47 cases. Hypertension existed in 38.5%.

TABLE IV.
THERAPY

Instrumental	Operative		Chemotherapy	
	No. cases	Deaths		
Dilatation of urethra	Nephrectomy.....	42	2	Urotropin Niazo
Bladder lavage	Nephrostomy			
	—unilateral.....	7	1	
	—bilateral.....	2	1	
Dilatation of ureter	Plastic on kidney.....	11	1	Methylene blue Potassium citrate
Pelvic lavage	Nephropexy.....	12	0	Mandelic acid Sulfonamides
	Other operations.....	8	2	
		—	—	
		82	7	
	End results		No. cases	Total of both groups %
			No. cases	%
Cured			51	214
Improved			20	101
Not improved			2	8
Died			7	7

Pyelonephritis.—There were 452 cases studied, showing 517 infections. Pyelonephritis alone was present in 173 cases; pyelonephritis and cystitis in 279 cases. The ratio of female to male was 3:1. The infection was bilateral in 40% of the cases, and on the right side only in 37%; 25% of the patients had had previous attacks of pyelonephritis. One of the most characteristic features of pyelonephritis is that it is a recurrent disease. Stricture of the ureter was recorded in 8% of the patients; 32% had permanent kidney damage as evidenced by a considerably reduced phenolsulphonphthalein test.

The treatment given and end results were as shown in Table IV. All patients were given chemotherapy in addition to any instrumental or operative procedure indicated.

It was found that the duration of treatment required to effect a cure varies directly with the length of time symptoms existed before treatment was started; 7% were cured within 1 week, 39% within 2 weeks, and 65% within 6 weeks. Mandelic acid and the sulfonamides were found to be the two most effective chemotherapeutic agents. The administration of sulfonamides is not without hazard and should be done only with great care.

The bacteriological indications for sulfonamide or mandelic acid therapy have been well summarized by Campbell.⁸ They may be modified as follows:

<i>Sulfonamide therapy</i>	<i>Mandelic acid therapy</i>
Gram-negative bacilli (<i>B. coli</i> , <i>B. Lacti</i> <i>aerogenes</i> , etc.)	Gram-negative bacilli (<i>B. coli</i> , <i>B. aerogenes</i> , etc.)
Staphylococcus	Staphylococcus
<i>Streptococcus hæmolyticus</i>	<i>Streptococcus hæmolyticus</i>
.....
Proteus	<i>Streptococci non-hæmolytic</i>
.....
Pyocyanus	<i>Enterococcus (Strepto-</i> <i>coccus faecalis)</i>
	Pyocyanus

The dosage for the sulfonamides varies from 5 to 60 grains depending upon the age of the patient, and the dose of mandelic acid varies from 30 to 120 grains a day. The sulfonamides are more effective in an alkaline urine. Mandelic acid requires a highly acid urine with a pH below 5.5. In the writer's opinion it is both unwise and unnecessary to unduly restrict the fluid intake. In children it is definitely dangerous to do so.

In this group of cases of pyelonephritis either with or without cystitis, 10% of all the cases eventually required nephrectomy. In the cases in which the blood pressure could be followed over a prolonged period of time, hypertension was found to be present in 29%.

The end results of treatment and the prognosis are summarized in Table V.

TABLE V.
SUMMARY
PYOGENIC INFECTION OF URINARY TRACT

Under 15 years of age.

- 20% have congenital lesions.
- 25% are immediately preceded by an acute upper respiratory infection.
- 30% require major urological surgery.
- 44% either have or develop hypertension.
- In uncomplicated cases there are 85% cured in 5 weeks with chemotherapy.

Pyelonephritis of pregnancy.

- Incidence of infection diminishes with each successive pregnancy.
- 2% of all the infections occur in the 1st and 2nd pregnancy.
- Maximum occurrence is at the 5th and 6th month.
- 85% of the patients can be carried to term by conservative treatment.
- 90% of these can be delivered of living babies.
- 25% are cured during pregnancy.
- 90% are cured within 2 weeks of emptying the uterus.

Cord bladder and fractured pelvis.

- Each case is an individual problem and must be treated as such.

Infection associated with prostatic hypertrophy.

- Bladder is always infected when either suprapubic or catheter drainage is instituted.
- The operation cannot be considered successful until the infection has completely disappeared.
- Treat by chemotherapy, dilatation of bladder neck, and bladder lavage.

Complicated by renal calculi.

- The infection cannot be cleared up until the calculus is removed.
- 30% develop recurrence of the infection.
- 40% eventually require nephrectomy.
- Only 50% succeed in clearing up their infection.

Complicated by stricture of the urethra in the female.

- Here the treatment is straightforward.

- { Dilatation of the urethra.
- { Bladder lavage.
- { Chemotherapy.

- 86% are cured within 1 month.

Cystitis.

- Treatment consists of chemotherapy—Mandelic acid or sulfonamides and bladder lavage.
- 73% are cured in 2 to 3 weeks.
- 20% more are asymptomatic.

Pyelonephritis.

- 25% have recurrent infection.
- 32% develop permanent renal damage.
- 65% are cured within 6 weeks.
- 10% require nephrectomy.

CONCLUSIONS

1. A brief review of the trend in the experimental and clinical investigation on renal pathology is presented, along with a detailed analysis of 1,000 cases of pyogenic infection of the urinary tract.

2. Pyogenic infections form certain "natural groups", in which the underlying pathology and prognosis is totally different, as is shown in Table V.

3. *B. coli* was the commonest infecting organism, other Gram-negative bacilli were the next

commonest, and staphylococci the third commonest. The bacteriology on culture agreed with the findings on stained smears in 67 to 73% of the cases.

4. An important characteristic of a pyogenic infection is its tendency to recurrence. In this study, recurrence occurred with a frequency from 10 to 30% in the various groups.

5. In the group under 15 years of age 20% of the cases had congenital anomalies, such as aberrant renal vessels, congenital valves, etc.; 25% were immediately preceded by an acute upper respiratory infection; 30% required major urological surgery. In the uncomplicated cases 85% were cured within 5 weeks with chemotherapy.

6. In the group associated with pregnancy, the incidence of infection was found to diminish with each successive pregnancy. Two-thirds of all the infections occurred in the first and second pregnancy. The maximum occurrence was at the 5th and 6th month; 85% of the patients can be carried to term by conservative treatment, and 90% of these can be delivered of living babies; 25% are cured of their infection during pregnancy; 90% are cured within 2 weeks of emptying the uterus. The incidence of hypertension in the cases that could be studied was 27%.

7. In the group complicated by renal calculi, it was found that the infection could not be cleared up until the calculus was removed; 30% developed recurrence of the infection; 40% eventually required nephrectomy.

8. In the cases associated with stricture of the urethra in the female, the treatment consisted of dilatation of the urethra, bladder lavage, and chemotherapy. There were 86% cured within one month.

9. In the cystitis cases 73% were cured within 2 to 3 weeks by chemotherapy and bladder lavage.

10. In the cases of pyelonephritis, not otherwise complicated, 25% had recurrence of the infection; 65% were cured within 6 weeks; 32% developed permanent renal damage, as evidenced by a reduced phenolsulphonphthalein test; 10% of these cases required nephrectomy.

11. Mandelic acid and the sulfonamides were found to be the two most effective drugs in combating the urinary infection. The range of organisms for which they were effective was greater than that of any other single drug used.

12. The duration of treatment required to effect a cure varied directly with the length of time symptoms existed before treatment was started.

13. There are some cases that would appear to be resistant to all known forms of therapy.

14. That pyelitis practically never exists without pyelonephritis is accepted as established. A considerably reduced phenolsulphonphthalein is absolute evidence of pyelonephritis.

15. Blood pressure studies were carried out over a prolonged period of time in 432 of the 1,000 cases studied. Of these, 130 either had or developed hypertension; an incidence of 30%.

REFERENCES

1. BARKER, N. W. AND WALTERS, W.: *Proc. Staff Meet., Mayo Clinic*, 1938, 13: 18.
2. BARNEY, J. D. AND SUBY, H. I.: *New Eng. J. Med.*, 1939, 220: 744.
3. BING, R. J. AND ZUCKER, M. B.: *J. Exper. Med.*, 1941, 74: 235.
4. *Idem: Proc. Soc. Exper. Biology & Med.*, 1941, 46: 343.
5. BOYD, C. H. AND LEWIS, L. G.: *J. Urol.*, 1938, 39: 627.
6. BRAASCH, W. F. AND WOOD, W. W. JR.: *J. Urology*, 1942, 48: 343.
7. BUTLER, A. M.: *J. Clin. Investigation*, 1937, 16: 889.
8. CAMPBELL, M. F.: *Bull. N. Y. Acad. Med.*, 1939, 15: 609.
9. CRABTREE, E. G.: *Tr. Am. A. Genito-Urin. Surgeons*, 1938, 31: 299.
10. CRABTREE, E. G. AND CHASET, N.: *J. Am. M. Ass.*, 1940, 115: 1842.
11. FARRELL, J. I. AND YOUNG, R. H.: *J. Am. M. Ass.*, 1942, 118: 711.
12. FREEMAN, N. E. AND PAGE, I. H.: *Am. Heart J.*, 1937, 14: 405.
13. GOLDBLATT, H., LYNCH, J., HANZAL, R. F. AND SUMMERSVILLE, W. W.: *J. Exper. M.*, 1934, 59: 347.
14. GOLDBLATT, H., GROSS, J. AND HANAL, R. F.: *J. Exper. M.*, 1937, 65: 233.
15. GOLDBLATT, H. AND WARTMAN, W. B.: *J. Exper. M.*, 1937, 66: 527.
16. GROLLMAN, A., WILLIAMS, J. R. JR. AND HARRISON, T. R.: *J. Am. M. Ass.*, 1940, 115: 1169.
17. HARRISON, T. R., BLALOCK, A. AND MASON, M. F.: *Proc. Soc. Exper. Biol. & Med.*, 1936, 35: 38.
18. LEADBETTER, W. F. AND BURKLAND, C. E.: *J. Urol.*, 1938, 39: 611.
19. MACLEAN, J. T. AND DEMING, C. L.: *J. Urol.*, 1943, 49: 236.
20. NESBIT, R. M. AND RATLIFF, R. K.: *J. Urol.*, 1940, 43: 427.
21. PAGE, I. H.: *J. Physiol.*, 1935, 112: 166.
22. *Idem: J. Am. M. Ass.*, 1939, 113: 2046.
23. PAGE, I. H. AND HELMER, O. M.: *J. Exper. M.*, 1940, 71: 29.
24. PAGE, I. H., HELMER, O. M., KOHLSTAEDT, K. G., FOOTS, P. U. AND KEMPF, G. F.: *J. Exper. M.*, 1941, 73: 7.
25. PATCH, F. S., RHEA, L. J., CODNERE, J. T.: *Canad. M. Ass. J.*, 1940, 43: 419.
26. PEARLMAN, R. O., THOMPSON, G. J. AND ALLEN, E. V.: *Proc. Staff. Meet., Mayo Clinic*, 1940, 15: 467.
27. PICKERING, G. W. AND PRINTZMETAL, M.: *Clin. Sc.*, 1938, 3: 211.
28. SANDHOLZER, L. A. AND SCOTT, W. W.: *J. Urol.*, 1939, 42: 183.
29. SCHROEDER, H. A. AND FISH, G. W.: *Am. J. M. Sc.*, 1940, 199: 601.
30. SCHROEDER, H. A. AND STEELE, J. M.: *Arch. Int. Med.*, 1941, 68: 261.
31. SMITH, H. W., GOLDRING, W. AND CHASIS, H.: *Bull. N.Y. Acad. Med.*, 1943, 19: 449.
32. WEISS, S. AND PARKER, F. JR.: *Medicine*, 1939, 18: 221.
33. WOODS, W. W.: *J. Urol.*, 1942, 48: 17.

Divisions of the Association

Manitoba Division

Despite many handicaps, the scarcity of doctors, the difficulty in obtaining gasoline and the pressure of work, the annual meeting of the Manitoba Division of the Canadian Medical Association, September 12 to 15, was the largest in its history. The attendance was 367, which included visitors from Ontario, Quebec, Saskatchewan, Alberta, the United States and Port of Spain, Trinidad. The commercial exhibits were the largest and most varied of any medical meeting in this province.

The visiting speakers were Dr. Harris McPhedran, Toronto, President of the Canadian Medical Association; Dr. William Magner, pathologist of St. Michael's Hospital, Toronto; Dr. Albert Ross, Montreal, and Dr. G. H. Stevenson,

Superintendent of the Ontario Mental Hospital, London, Ont.

Dr. D. C. Aikenhead, President of the Manitoba Division, entertained the executive committee and the visitors at dinner in the Fort Garry hotel on the evening of September 12. Two representatives of labour were present. Mayor Garnet Coulter and Hon. Ivan Schultz, Minister of Health and Public Welfare, welcomed those present.

A feature of the convention was the public meeting in Grace Church on September 13. Dr. Aikenhead presided and the speakers were Dr. McPhedran, whose subject was "The place of the medical man in a national health insurance scheme". He urged all Canadian citizens to co-operate with the medical profession so that together we may go hand in hand in fashioning something that will give us, as a free people and free practitioners, the best medical services in the world. Dr. Magner, speaking on cancer, said that the chances of healing cancer patients were good if the patients were treated while the growth was small and strictly localized. Early diagnosis and skilled treatment, he said, called for the services of highly trained specialists, and the removal of the economic barrier, which too often existed, was of urgent importance.

Speaking at a luncheon meeting on September 14 Dr. Stevenson outlined a series of mental health principles which should be preventives of mental disorder in the normal life of a normal person.

Dr. Albert Ross discussed "Acute diverticulitis of the sigmoid" at a meeting on the morning of the 14th.

At a luncheon meeting the following day, Dr. J. R. Davidson, Winnipeg, gave his views on the origin and treatment of cancer. He suggested that future research into the nature of cancer should start with the study of endocrine glands of cancer patients.

Lieut.-Col. C. H. A. Walton, Winnipeg, who has recently returned from four years' service overseas, spoke of medical experiences in England and elsewhere.

The business meeting showed the Division to be in a healthy state, with 384 paid-up members, which represents about 94% of the maximum total membership obtainable in the province. It was announced that Manitoba Medical Service, a voluntary health insurance scheme under the Manitoba Division, was expected to be in operation on October 1. Refresher courses for medical graduates who had been taken into war services immediately after graduation and had never engaged in civilian practice are being planned by the Medical Education Committee.

Officers were elected as follows: *President*—Dr. Stuart Schultz, Superintendent of Brandon Mental Hospital; *First Vice-president*—Dr. P. H. McNulty, Winnipeg; *Second Vice-president*

—Dr. J. R. Martin, Neepawa; *Honorary Secretary*—Dr. D. L. Scott; *Honorary Treasurer*—Dr. A. M. Goodwin; *Members-at-large of the Executive*—Dr. J. M. Mathieson, Brandon; Dr. Hugh L. Cameron, Winnipeg.

The annual golf tournament was held on the afternoon of September 15 at St. Charles Country Club.

ROSS MITCHELL

Correspondence

"Old Soldiers Never Die"

To the Editor:

Twenty-six years ago many of us were perhaps more alive than we are today but perhaps not so alive to our good fortune. In 1918, "zero hour" instead of "D" day meant much the same thing, but we were young and our luck was in, rations were ample and we thought our equipment was nearly adequate. We were young doctors on the great adventure, filled with new teaching and proud of our three stars which stuck with us for duration. The purchase of crowns was of concern to only a few fortunate ones of our acquaintance! No matter what our previous service, the period from Boves in August to Bonn for Xmas is an extra special memory. Movement, success for our armies and new country and new experiences after the long stalemate. The Canadian Corps and Canadian medical units had lived through the tough times and then were sure as they always had been that come what might they were masters in their own specialty of doing any job that offered.

Today another generation of Canadian doctors is part of a Canadian Army travelling the same road, doing the same job in an even faster moving warfare. Transportation has changed remarkably but a pair of good feet is still a blessing if current reports can be believed. Food is still a major subject for thought and discussion and all the vitamins in the standard ration still fail to dim the memory of the soldier when he thinks of the result of the get-together of a thick steak and a buttered skillet.

For Dakin's solution and bipp we now read sulfonamides and penicillin. Splints are new and treatment of wounds and disease has been bettered. Casualties are moved from the field to bases with a speed unheard of in the Great War. Statistics of recovery are better. Gratuities are to be bigger and rehabilitation is a new syndrome with headache as its most prominent symptom.

We who stayed at home this time have lost some sleep, a large part of our income by tax and undoubtedly some of our enthusiasm, but our luck is still in. Some of us are still alive to be proud that the traditional spirit of the R.C.A.M.C. is being carried by a fast-moving

generation of Canadian doctors in many old and new fields wherever the best fighting is being done by the best fighting men.

A. STANLEY KIRKLAND

Saint John, N.B.,
October 10, 1944.

University Notes

McGill

McGill University's course in tropical medicine, which was recently inaugurated, is unique in that it not only involves study at the university but also clinical work in the tropics.

Dr. F. Cyril James, principal and vice-chancellor, in describing the new course, stated: "For the first time in the history of medicine, a diploma in tropical medicine has been instituted which requires clinical training in tropical diseases on the spot. This combines laboratory work in temperate climates and clinical work in the tropics.

"The idea is an entirely new one anywhere in the world and the present achievement has been made possible through the co-operation of the Aluminum Company of Canada, Ltd., with McGill University."

Three medical officers of the Canadian Navy, Surgeon-Lieutenants John W. Hackney, H. H. McKinnon and Robert H. Lennox, left the Dorval airport recently for British Guiana where for a few months they will take clinical and pathological training under tropical conditions. This is part of the postgraduate course in tropical medicine instituted at McGill.

PARASITOLOGY COURSE

The three surgeon-lieutenants had previously taken a course in parasitology under Dr. T. W. M. Cameron, director of the Institute of Parasitology at Macdonald College. Clinical lectures in parasitology were given by Major D. Bews, of the Canadian Army, who had gained much medical experience in Asia.

The three Canadian armed forces are showing a keen interest in this new department at McGill. In addition to the Navy, the Army and the Air Force have sent some of their doctors to start the course at Macdonald College, prior to further training under tropical conditions with doctors attached to the Demerara Bauxite Company, a subsidiary of the Aluminum Company of Canada.

"McGill University," Dr. James commented, "had been hoping to establish such clinical facilities as are now available, but mostly as a postwar project because of war-time difficulties in carrying it through at the present. We are indeed happy that through the assistance of the Aluminum Company of Canada, Ltd., this

could be made possible now, at least for doctors of the Armed Forces who, we hope, will be followed by civilian doctors.

"This is a big step ahead in medicine. It must be remembered that despite the obvious importance of this clinical training it has not previously been a required part of any course leading to a diploma in tropical medicine. Moreover, at the present time, no university in the British Commonwealth or in the United States is known to be offering a course of precisely this kind."

Gifts, grants and bequests totalling more than \$70,000 have been acknowledged by McGill University following a meeting of the Board of Governors. Dr. James, in making known the list of gifts also announced a number of staff promotions and changes. These included the appointment of Dr. Alton Goldbloom, well-known child specialist, as chairman of the department of paediatrics, succeeding Dr. R. R. Struthers, who has accepted an appointment under the United Nations Relief and Rehabilitation Administration.

MORGAN HOUSE DONATED FOR ANATOMY RESEARCH

The Morgan House and grounds at 3619 University Street have been donated to McGill University by the Frank W. Horner Company, announced Dr. F. Cyril James. Dr. Hans Selye, associate professor of anatomy, will be in charge of the building.

The house will be transformed into research laboratories devoted to the promotion of graduate studies and research in the fields of hypertension, rheumatic fever and hormone products.

NOW FOR THE SEVENTH. As V-Day approaches, more and more money is needed. Our boys "over there" must be completely equipped and kept supplied with all the equipment required to finish the job. They must not only be backed to the limit but must also know that those on the home front are behind them 100%. It's an all-out drive for money to support an all-out drive for final victory. Invest in Victory—Buy Victory Bonds.



Canadian Medical War Services

MEDICAL OFFICERS APPOINTED TO THE R.C.A.M.C.—ACTIVE FORCE JULY, 1944

(Previous sections appeared in the issues of February, March, May, July, September, November and December 1943, and in each issue for 1944 except April and September.)

SECTION XXVIII

Name	Address	Date of Appointment	Name	Address	Date of Appointment	Name	Address	Date of Appointment
Avren, S. S., Winnipeg		26-5-44	Lightfoot, A. S., Toronto		20-5-44	Piper, S. A., Ceylon, Ont.		19-5-44
Ayre, W. B., Mount Royal, Que.		6-6-44	McAlpine, D. G., Edmonton		19-5-44	Porcheron, R., Kirkland Lake, Ont.		19-5-44
Barnett, G. D., Regina, Sask.		26-5-44	McAlpine, W. A., Vancouver		26-5-44	Prowse, W. A., Toronto		19-5-44
Barniecki, P. J., Cudworth, Sask.		26-5-44	McCorriston, J. R., Ridgedale, Sask.		19-5-44	Rich, P. J., Wilcox, Sask.		26-5-44
Bell, W. N., Winnipeg		26-5-44	MacDonald, A. R. S., Coaldale, Alta.		5-5-44	Rigg, F. J., Niagara-on-the-Lake, Ont.		19-5-44
Bellamy, R. P., Lumsden, Sask.		26-5-44	McDougall, J. A., Brockville, Ont.		19-5-44	Rigg, L. I., Dunnville, Ont.		19-5-44
Broadwell, D. J., Windsor, Ont.		20-5-44	McGoey, J. S. J., Pontieux, Sask.		19-5-44	Routley, E. F., Toronto		19-5-44
Burroughs, R. B., Swift Current, Sask.		26-5-44	McIntosh, W. C., Ottawa		12-6-44	Rumball, N. H., Toronto		19-5-44
Cameron, I. B., New Westminster, B.C.		26-5-44	McLellan, T. A., Kirkland Lake, Ont.		19-5-44	Ruskin, S. G., Winnipeg		26-5-44
Cates, B. A., Reston, Man.		26-5-44	McLeod, J. M., Sarnia, Ont.		19-5-44	Schulde, J. M., Windsor, Ont.		20-5-44
Currie, E. A., London, Ont.		20-5-44	Marshall, G. M., Simcoe, Ont.		20-5-44	Shapiro, M. J., Toronto		19-5-44
Demarco, F. G., Windsor, Ont.		20-5-44	Maxwell, L. T., Portage la Prairie, Man.		26-5-44	Smith, G. G., Toronto		19-5-44
Dubo, S., Toronto		14-7-44	Merritt, J. O., Grimsby, Ont.		20-5-44	Southcott, F. R., London, Ont.		20-5-44
Fleming, R. A. P., Sundridge, Ont.		20-5-44	Miller, M. F., Montreal		30-6-44	Stewart, D. A., Sintaluta, Sask.		19-5-44
Fulton, J. R. W., Toronto		19-5-44	Moore, A. H., Estevan, Sask.		26-5-44	Taylor, C. L., Toronto		19-5-44
Goldberg, A. E., London, Ont.		20-5-44	Murphy, D. K., Saskatoon, Sask.		19-5-44	Tauber, A. S., Windsor, Ont.		19-5-44
Harper, R. R., Regina, Sask.		26-5-44	Murray, J. F., Toronto		19-5-44	Titcombe, E. P., Toronto		19-5-44
Helem, E. V., Medera, Man.		26-5-44	Neville, J. W., Vancouver		26-5-44	Turner, J. A., Toronto		19-5-44
Hunter, J. E., Calgary (Military District No. 13)			Obniowka, N., Toronto		19-5-44	Victor, M. B., St. Catharines, Ont.		19-5-44
ceases to be seconded to R.C.A.F. To be Col. and to be D.M.O.		23-7-44	Oestreicher, D. L., Dashwood, Ont.		20-5-44	Wall, M. B., Winnipeg		26-5-44
Jackson, C. C., Calgary		26-5-44	Oughtred, O. W., Cainsville, Ont.		19-5-44	Warren, R. F., Kamloops, B.C.		19-5-44
Kierluk, E. W., Vegreville, Alta.		20-5-44	Orr, W. J., Niagara Falls, Ont.		19-5-44	Warriner, G. R., Winnipeg		26-5-44
Kirk, D. K., Vancouver		26-5-44	Parker, R. G., Watford, Ont.		19-5-44	Weinberg, J. M., Toronto		19-5-44
Lacroix, W. R., Tisdale, Sask.		26-5-44	Patterson, R. J., Prescott, Ont.		19-5-44	Wells, C. M., Ottawa		19-5-44
Lamb, E. R., Dunnville, Ont.		20-5-44	Paul, G. M., Napanee, Ont.		19-5-44	Whalen, J. S., Toronto		19-5-44
						White, W. S., Toronto		19-5-44
						Whiting, M. L., Toronto		19-5-44
						Wilson, A. P., Windsor, Ont.		19-5-44
						Wishart, J. M., Mount Dennis, Ont.		19-5-44

MEDICAL OFFICERS STRUCK OFF STRENGTH OF THE R.C.A.M.C.—ACTIVE FORCE JULY, 1944

Name	Address	Date struck off strength	Name	Address	Date struck off strength	Name	Address	Date struck off strength
Bates, J. F., New Aberdeen, N.S.		27-6-44	Johnston, B. S., Montreal		4-7-44	Swanton, A. L., Moose Jaw, Sask.		20-4-44
Elliott, T. J., Larder Lake, Ont.		26-6-44	Lacasse, L. J., Beauce, Que.		4-7-44	Taylor, R. B., Montreal		16-6-44
Hancock, G. R., Regina, Sask.		10-4-44	MacFarlane, J. C., Kingston, Ont.		5-5-44	Valeriote, S. L., Guelph, Ont.		deceased
			Miron, D., Outremont, Que.		12-6-44			
			Roy, J. F., Quebec, Que.		4-7-44			



Abstracts from Current Literature

Medicine

Gargoylism. Lurie, L. A. and Levy, S.: *Am. J. M. Sc.*, 1944, **207**: 184.

The parents of the two patients, both males, the only two children in the family, were not related. The mother was 24 at the birth of the first, 25 at the birth of the second child. Both were short, had the characteristic facies, the enlarged liver and spleen, the umbilical hernia, the feeble-mindedness that go with gargoylism. The corneal clouding was absent. This disease belongs to the group of lipoidoses.

MADGE THURLOW MACKLIN

A Pedigree of Mental Defect Showing Sex-linkage. Martin, J. P. and Bell, J.: *J. Neurol. & Psychiat.*, 1943, **6**: 154.

Although the mental defect showed up as imbecility in 11 males and as mental deficiency in two females, the mode of inheritance is not clear, since in two instances the trait descended through unaffected males. The affected persons were all descended from a man whose father had died in an insane asylum. This man had four children, three sons, A, B and C, and a daughter. The latter had two imbecile sons. C had four normal children. A had 10 normal children, but one of his daughters had three imbecile sons in addition to 6 normal children. B had 2 sons and 7 daughters, all normal; but one daughter had 2 imbecile sons; a second daughter had one imbecile son and a mentally defective daughter; a third had two imbecile sons; a fourth had one imbecile son and a fifth had a mentally deficient daughter. There can be no doubt that the mental defect was inherited in this family, but it was not transmitted as haemophilia, for example, nor as an incompletely sex-linked defect, nor as one carried in the Y chromosome. Its mode of transmission is not quite clear.

MADGE THURLOW MACKLIN

Arachnodactyly in Four Siblings. Pasachoff, H. D., Madonick, M. J. and Drayer, C.: *Am. J. Dis. Child.*, 1944, **67**: 201.

These authors report arachnodactyly in two boys and two girls, whose father and paternal grandfather had a similar condition, although apparently not so marked. All had the very elongated fingers and toes, and the youngest of the four children had hydrocephalus, and was mentally deficient. The third child did not have an outspoken hydrocephalus, but did show some dilatation of the ventricles, when injected with air.

Although the majority of patients with this condition do not appear to give a family history of it, there are quite a few families on record in which several generations have been affected.

MADGE THURLOW MACKLIN

The Treatment of Meningococcus Infections with Special Reference to the Waterhouse-Friderichsen Syndrome. Bush, F. W. and Bailey, F. R.: *Ann. Int. Med.*, 1944, **20**: 619.

An epidemic of meningococcus infections at a naval training station is discussed. Seventy-six consecutive cases of meningococcus meningitis seen since the opening of the hospital recovered satisfactorily with sulfonamide therapy. Fifty consecutive cases of meningococcus bacteraemia also recovered satisfactorily with sulfonamide therapy.

Six cases are discussed which presented the characteristic clinical features of the Waterhouse-Friderichsen syndrome. Two of these patients recovered.

Of the four fatal cases, all of which came to autopsy, three had bilateral, and one unilateral adrenal haemorrhage.

S. R. TOWNSEND

Tuberculosis of the Lower Lobe. Ossen, E. Z.: *New England J. Med.*, 1944, **230**: 693.

Tuberculosis originating in the lower lobe is comparatively infrequent and 14 cases (2%) were found among 700 admissions to the Norfolk County Sanatorium during 1931 to 1937. Most lower lobe tuberculosis is situated in the upper part of the lobe, lesions just above the diaphragm being very rare, it is more frequent in women than in men and in the right lower lobe than in the left and in the younger rather than the older age groups. Race and nationality seem to play no part.

The author divides his cases into two groups, "pure" and "impure". In the "pure" type all evidence of tuberculosis was limited to the lower lobe, there was a strong history of intimate family contact with tuberculosis and the onset was usually acute. The "impure" group showed evidence of disease elsewhere in the lungs, the family history was usually negative and these cases should be considered metastatic from an old apical lesion which had lighted up during a period of diminished resistance.

The reason for the predominance of lower lobe tuberculosis among women has never been satisfactorily explained. In this group of 14 cases 12 were females. Whereas the impure group is probably metastatic from a reactivated apical lesion two mechanisms may explain the pathogenesis of the pure group, first, bronchogenic or haemogenous spread from the lymph-node component of a primary tuberculous complex or, second, direct extension from the latter's parenchymal component, which is usually situated in the lower lobe. These latter cases are rare and are usually fulminating.

In apical tuberculosis the diagnosis can usually be made by x-ray but in the case of the lower lobe the presence of the tubercle bacillus must always be demonstrated either in the sputum or from gastric lavage. This may not be possible for some weeks or even months after the chest disease is clinically apparent and may lead to an erroneous diagnosis of slowly resolving pneumonia or of bronchiectasis.

The prognosis of lower lobe tuberculosis does not differ from that for pulmonary tuberculosis in general and treatment also is identical. When surgery is indicated lobectomy and pneumonectomy may be the procedure of choice in certain cases. NORMAN S. SKINNER.

Surgery

Effects of Continuous and of Intermittent Application of a Tourniquet to a Traumatized Extremity. Blalock, A.: *Arch. Surg.*, 1944, **48**: 489.

This experimental work was done at the Johns Hopkins Hospital. It is generally recognized that one should not employ a tourniquet for the control of bleeding if other means will suffice. If the use of a tourniquet is necessary, it is desirable to release it from time to time in order that some oxygen may be transported to the ischemic tissues. Unfortunately such intermittent release results in the loss of a prohibitive quantity of blood. It appeared to be of interest to investigate experimentally the comparative effects of continuous and of intermittent application of a tourniquet to a traumatized extremity. In previous experiments it was found that the application of a tourniquet to a traumatized extremity reduced the chances of survival of the animal. Cooling of the part distal to the tourniquet lessened the ill effects of the ischaemia and the anaemia. Anaesthesia of the large animals was induced by the intravenous administration of 30 mgm. of pentothal sodium per kilogram of body weight. Two experiments were performed simultaneously; in one the application of the tourniquet was continuous, and in the other it was intermittent. In half of the experiments the tourniquet was left in place for 5 hours. In the other experiments the tourniquet was released for two minutes out of every thirty minutes during the 5 hour period. The differences in the two groups were more marked than had been anticipated. Only one of the 13 animals survived in

the group in which the tourniquet was left in place for five hours, whereas 8 of the 13 survived in the group which the tourniquet was released intermittently.

G. E. LEARMONT

Peritoneal Tap. Kaufman, L. R. et al.: *Arch. Surg.*, 1944, 49: 39.

Peritoneal tap was first performed by Solomon in 1906. It affords important and useful information in the management of peritonitis. Recent contributions on this subject were made by Cole, in 1937, and by Sternberg in 1939, but there were few references in the literature between 1906 and these dates. At first employed only in cases of perforated peptic ulcer, peritoneal tap is now being more generally used for a variety of conditions in which it assists in diagnosis and prognosis. It is performed with a No. 18 or 19 gauge needle, 2½" long, through a small procain hydrochloride wheal below the umbilicus or to either side or in the epigastrium. Care must be taken when distension is marked. Coils of intestine may be adherent to the anterior portion of the abdominal wall. The needle must be introduced with a stylet or attached to a syringe to prevent the entrance of blood during its passage through the abdominal wall. Aspiration is done by shifting the needle in various directions, until fluid is withdrawn, a small amount being sufficient for examination. Smears are made on glass slides and stained by Wright's and Gram's stains. Cultures are taken. The author concludes that peritoneal tap is a practical and safe procedure. In children it serves to differentiate streptococcal and pneumococcal peritonitis from appendicitis. Peritoneal tap should be reserved for a selected group of cases presenting confusion in diagnosis and the interpretation of the smear must be painstaking.

G. E. LEARMONT

Obstetrics and Gynaecology

Dicoumarin in the Treatment of Puerperal Thrombosis. Davis, A. and Porter, M.: *Brit. M. J.*, 1944, 1: 718.

There is no doubt that dicoumarin is of value in the particular type of patient investigated, and in these cases of established thrombosis it would appear to be fairly safe. The freedom from haemorrhagic complications may be due to the normal increase in the coagulability of the blood during the puerperium; but whatever the factor concerned it is of significance, for this is the only considerable series which does not contain at least one instance of dangerous bleeding, and that in spite of a fairly high dosage. But the fact that other observers have reported accidents of a serious nature so frequently in the treatment of similar conditions must necessarily modify final judgment, and there is no doubt that the drug needs extremely careful handling. We believe, however, that the results obtained justify its employment, always provided that the haematological effects are stringently controlled by daily prothrombin or coagulation-rate estimations by a skilled laboratory technician.

Ross MITCHELL

The Elderly Primipara. Kuder, K. and Johnson, D. G.: *Am. J. Obst. & Gyn.*, 1944, 47: 794.

The incidence of elderly (*i.e.*, 35 or over) primiparas in the series studied was 2.68%. The incidence of toxæmia in these patients was almost twice as high as in the clinic as a whole, 13.98% as compared with 7.29%. Myoma uteri was three times as high (5.9% as against 1.9%). Funnel pelvis was found comparatively often, accounting for 45.3% of pelvic contractions in elderly primiparas compared with 28.2% in the clinic.

When the elderly primipara goes two weeks or more past the expected date of delivery, the incidence of prolonged labour is 28.91%, of operative delivery 69.87%, and of infant mortality 24.09% as compared with 17.59, 55.54, and 7.64% respectively, for the entire group of elderly primiparas. The average duration of

labour for this group was 20.41 hours against 18.0 hours for all primiparas in the clinic.

The incidence of operative deliveries was 55.54% and of Cæsarean section 13.38%, while in the clinic as a whole these incidences are 24.3 and 2.9%, respectively.

The gross infant mortality was 7.64% as compared with 3.7% for the clinic as a whole. The maternal mortality was 7.2 per 1,000 pregnancies as compared to 1.6 per 1,000 pregnancies for the total clinic.

The mere fact that a patient is an elderly primipara is not in itself an indication for Cæsarean section. If, however, there is an added factor which under any circumstance would be an indication for Cæsarean section or would increase the fetal mortality rate, this operation is justifiable. For it is recognized that in selecting the type of delivery for this group of patients, the greater importance of the fetus does play a rôle. This is especially true when the patient gives a long history of relative sterility or of repeated spontaneous abortions.

ROSS MITCHELL

The Hogben Pregnancy Test. Landgrebe, F. W. and Samson, L.: *J. Obst. & Gyn. Brit. Emp.*, 1944, 51: 133.

Two hundred and fifty-eight tests for pregnancy, using the Scott technique for extraction of urine, were undertaken in a series of cases in which clinical diagnosis was doubtful. Two hundred and twenty have been checked against ultimate finding and, except in 2 cases where the patient showed menopausal symptoms, were found correct. Two toads are sufficient for each test if they are in good condition. Each toad was used over 24 times and still responds satisfactorily. Laboratory-bred Xenopus can be used for the test and are capable of producing a second generation which will also respond to pregnancy urine extracts. The Hogben test can be carried out at a fraction of the cost, is more rapid than, and is at least as reliable as, the Friedman and the Aschheim-Zondek tests.

P. J. KEARNS

Post-eclamptic Kyphosis. Bierer, G.: *J. Obst. & Gyn. Brit. Emp.*, 1944, 51: 130.

Three cases with post-eclamptic changes in the spine are reported. All were in good health prior to pregnancy. Two showed changes of the dorsal region similar to those described after tetanus and convulsion-therapy; the third showed a traumatic disc rupture with compression fracture of the 1st lumbar vertebra. It is suggested that these changes, due to abrupt and recurring muscle contraction acting on the bones, exceed the limit of elasticity and finally cause a split of the trabeculae, with an accentuated dorsal kyphosis or a fracture proper. From the therapeutic point of view we recommend examination of the spine in cases of eclampsia before they leave hospital and again after 4 weeks. If spinal changes are present a plaster of Paris corset should be applied for about 12 weeks and suitable physical exercises should be given. This treatment ought to prevent secondary deformities. Finally, the tendency to calcium deficiency in pregnancy should be remembered and this shortage should be met by calcium administration.

P. J. KEARNS

Clostridium Welchii in the Female Genital Tract. Salm, R.: *J. Obst. & Gyn. Brit. Emp.*, 1944, 51: 121.

Of 843 high vaginal swabs from puerperal patients showing morbidity of varying degree, 50, or 6%, showed the presence of *Cl. welchii*. Two control series of 600 high vaginal swabs from the antenatal clinic and venereal diseases clinic showed an incidence of *Cl. welchii* of 6.33 and 7.67%.

There was no evidence clinically that *Cl. welchii* had any greater pathogenic effect in these cases than the *B. coli* with which it was commonly associated. The presence of *Cl. welchii* in a high vaginal swab is not, without clinical evidence of invasion, sufficient to cause institution of specific treatment against the organism.

P. J. KEARNS

Ophthalmology

The Value of Penicillin in the Treatment of Superficial Infections of the Eyes and Lid Margins. Crawford, T., R.A.M.C. and King, E. F., R.A.M.C.: *Brit. J. Ophthal.*, 1944, 28: 373.

The investigations were on 4 groups of cases. First, conjunctivitis without secondary involvement of the cornea. Second, conjunctivitis with either superficial and diffuse, or marginal corneal infiltrations. Third, conjunctivitis with a single large secondary corneal ulcer or infiltration dominating the clinical picture. Fourth, chronic blepharitis of a severe nature with subacute exacerbations of the infection.

In none of the patients was there any associated infection of the lachrymal passages. A number had received previous treatment, but this did not appear to influence the penicillin treatment.

The sodium salt of penicillin was used either as drops or ointment. The drops consisted of a sterile aqueous solution containing 250 units of penicillin per c.c. The ointment consisted of 30% lanette wax in water and penicillin added to give 250 units per gram.

The drops were used in the first group, being instilled every four hours day and night. One or two drops were used each time. The ointment was used in the second, third and fourth groups. The average consumption for a bilateral case, under treatment for ten days, was 20 c.c. or 20 grams, which represents a total of 5,000 units of penicillin.

About half of the patients complained of a smarting pain for 10 or 20 minutes after use of the drops or ointment, but in none was damage to the corneal epithelium noted. The penicillin was used for 7 days after the cultures from the conjunctival sac had become negative. Each patient was kept under review for 6 or 7 weeks.

The authors describe precautions taken to prevent occurrence of cross infection, and the bacteriological methods of examining the conjunctival cultures, also the methods of testing for the persistence of penicillin in the discharge, and give tables showing this persistence when either drops or ointment were used.

Then follows a complete analysis of the cases in each of the four groups, and tables showing the clinical and bacteriological condition before treatment, and the clinical and bacteriological response to treatment.

In conclusion, it is stated that as a local therapeutic measure for superficial infections of the conjunctiva, cornea, and the lid margins, penicillin far exceeded any therapeutic agent hitherto employed. It would seem that it is highly effective in stubborn cases which have proved resistant to the usual methods of treatment. Bacteriologically the penicillin as used eradicated sensitive organisms. It cannot prevent reinfection, nor do the authors believe that effective penicillin therapy establishes any immunity. In the cases in this series which showed relapses the organisms causing the relapse were as sensitive to penicillin as were the causative organisms of the original infection.

A. ERNEST DOULL

Neurology and Psychiatry

Old Age from the Standpoint of the Traffic Situation. Selling, L. S.: *Am. J. Orthopsych.*, 1944, 14: 276.

There are two life periods in which the driver of a vehicle is accident-prone, from 16 to 21 and from 60 upward. In discussing the causes of accidents in which older people are involved the author points out that in these patients there is evidence of visual defect; some have cataracts or an incipient cataract, others have defects of the psychophysical mechanism. Their reaction to time is slowed down and their capacity to judge speed and distance is inferior. There is also evidence in certain of these of judgment defects, and some lack insight and do not appreciate that there is anything wrong with them, even though they have been involved

in many accidents. Alcoholism among older people is not as common as among younger persons and therefore is not a contributing cause of traffic accidents in these patients. The most serious difficulty to cope with is that of memory defect, and because of this disability some of the older patients are not aware of what they are doing. Where such findings indicate the obvious inability of the patient to cope with traffic problems they should not be permitted to drive vehicles. A reference is also made to the aged pedestrian who is more liable to be involved in traffic accidents. This again is evidently related to poor judgment or visual defect.

BARUCH SILVERMAN

The Effect of Intrafamily Discord on the Prognosis of Epilepsy. Price, J. C. and Putnam, T. J.: *Am. J. Psych.*, 1944, 100: 593.

If the family group as a whole takes a realistic and helpful point of view about illness, the patient is placed in the best possible situation to profit from his medical treatment and find a place in society. On the other hand, if relatives have a sense of shame about this disease, they create in the patient a state of anxiety and distress which has an unwholesome effect on such individuals. This is particularly important in young patients, since seizures begin during or before adolescence in over 75% of cases, and so frequently this results in an over-protective attitude on the part of the parents, thus encouraging the development of an immature adolescent approach to life on the part of these epileptics. Case histories are quoted to illustrate this point, and to emphasize the fact that fear of seizures by patient or relatives is sometimes a greater handicap than the seizure itself. It is also important for the patient to assume responsibility for his medication and to observe certain precautions. Patient and family should understand as much as possible of the modern point of view about seizures and the principles of treatment. Faulty attitudes such as shame, over-protection and over-strictness on the part of the patient's family frequently interfere with his recovery.

BARUCH SILVERMAN

The Physiological Basis of Concussion. Walker, A. E., Kolros, J. J. and Case, T. J.: *Neurosurg.*, 1944, 1: 103.

Cerebral concussion is generally agreed to be a traumatically induced derangement of the nervous system, characterized clinically by temporary impairment of consciousness, dizziness, mild confusion and headache, and unassociated with gross anatomical changes in the brain.

When any animal is struck on the head by a blow of sufficient force to cause immediate unconsciousness, many observers have noted that there is an immediate generalized muscular spasm. These tetanic manifestations of concussion appear to be evidence of intense stimulation of the central nervous system involving not only the lower centres but also the cerebral cortex since the latter appears to be one of the determinants of the clonic phase of a convulsion. Respiratory changes usually occur with a concussive blow. These may consist of merely a short gasp, with resumption of normal respiration, a gasp with temporary irregular respiration, or a gasp with apnoea of short or long duration. An animal may be rendered unconscious by a blow to the head without alteration in the blood pressure or pulse, but usually immediately or within a few seconds after a concussive blow, a rise in blood pressure of varying degree occurs. This arterial hypertension is, like the respiratory arrest, due to the effect of the trauma upon the brain stem, for it may be produced by concussion in the decerebrate animal. Not infrequently at the moment of the blow or within one beat thereafter, a marked slowing of the pulse is noted. This does not occur if the vagus nerves have been sectioned. In the spinal cord, immediately after a concussive blow, the tendon reflexes may be abolished and the threshold of the anterior horn cells heightened. If the spinal cord

is sectioned before the blow is delivered, there is no alteration in the tendon reflexes. With the impact of a blow on the head, marked changes in the electrical potentials occur within the central nervous system. Fast spiky cortical activity is not unlike that seen during a major convulsive seizure, and in fact it may be so accompanied in a non-curarized animal.

There is at the moment of the blow a marked electrical discharge within the central nervous system, which affects all parts of the nervous system to varying degrees and which manifests itself by excitation of the peripheral nerves. This analysis has demonstrated that both the clinical manifestations and electrical accompaniments of cerebral concussion indicate that the process is one of excitation of large masses of neurons within the central nervous system. It is therefore suggested that the physiological basis of concussion consists of the traumatic discharge of the polarized cell membranes of the neurons of the central nervous system by the shaking up or commotion of the brain and that the subsequent course of events is that which would be expected when large masses of nerve cells discharge, such as is seen in the spontaneous or electrically induced convulsive seizure.

FRANK TURNBULL

Dermatology

Pemphigus. Lever, W. P. and Talbott, J. H.: *New England J. Med.*, 1944, **231**: 44.

In pemphigus there is frequently a reduction in the amount of sodium, chloride, calcium and protein in the blood serum. This is a secondary effect only and its degree parallels the severity of the disease. Treatment with adrenocortical extract, dihydrotachysterol or massive doses of vitamin D tends to correct this reduction and bring about improvement. The authors discuss the results of this type of therapy in 32 patients with pemphigus.

NORMAN S. SKINNER

Pathology and Experimental Medicine

Ossification Sequences in Identical Triplets. Sontag, L. W. and Reynolds, E. L.: *J. Heredity*, 1944, **35**: 57.

These triplets, who are undoubtedly from one egg as determined by numerous criteria, have been x-rayed in a study of ossification centres every six months from the age of two to fourteen and a half years. The value of such a continued study is shown because at certain periods the degree of ossification would be quite similar in the three, and at other times much less so. Had only a single study been made at the latter times an erroneous conception as to the extent of dissimilarity between identical triplets would have been gained, and, similarly, a single study made at the point of greatest resemblance would have emphasized their likeness unduly. The sequence in which the centres appeared, and the time of onset in these triplets, although differing, were much more nearly similar than they are in sibs who are not identical twins or triplets, and much more nearly similar than they are in non-sibs who differ among themselves even more widely than do children in the same family. All three had extra epiphyses at the base of the second metacarpal in both hands. This is a rare anomaly, and the fact that all three showed it is strong confirmatory evidence that they are from one egg. Because of the difference in onset of these centres in these one egg-triplets the authors concluded that certain environmental factors, or acquired metabolic characteristics, may be capable of modifying the genetic pattern of ossification.

MADGE THURLOW MACKLIN

Hygiene and Public Health

The Influence of Supplements of Vitamins A, B₁, B₂, C and D on Growth, Health and Physical Fitness. Bransby, E. R., Hunter, J. W., Magee, H. E., Milligan, E. H. M. and Rodgers, T. S.: *Brit. M. J.*, 1944, **1**: 77.

This is a brief account of a test conducted on a group of children and industrial workers to ascertain the effect, if any, on health and efficiency of the supplementation of ordinary diet with certain vitamins. Vitamin capsules were used containing: vitamin A, 4,000 international units; thiamin, 333 international units; riboflavin, 2 milligrams; ascorbic acid, 1,000 international units; nicotinamide, 20 milligrams and vitamin D, 600 international units.

One thousand two hundred and forty-two children and 214 factory workers were tested. In each case the groups were divided equally into a group receiving the vitamin capsules and a control group receiving a capsule of arachis oil which was practically devoid of vitamins.

In the case of the children measurement of growth, nutritional status, muscular strength (by dynamometer), condition of teeth and gums and absenteeism indicated no statistical difference between the vitamin group and the control group. In one area 370 boys aged 9 to 13 were given a special endurance test by hanging from a bar. The vitamin group showed a greater improvement than the control group, but the number of children involved was thought to be too small to justify general conclusions.

In the case of the industrial workers, the results showed that the vitamin capsules had no significant effects on weight, haemoglobin, blood pressure, absenteeism from sickness or output of work. FRANK G. PEDLEY

Industrial Hygiene

How Can Ophthalmologists be of Greater Service to Industry in Wartime? Selby, C. D.: *Sight-Saving Rev.*, 1943, **13**: 160.

This is a paper presented before the American Academy of Ophthalmology and Otolaryngology, endeavouring to show how the ophthalmologist can participate in the industrial medical program of today. Present programs include not only the care of injuries but the prevention of sickness and the care of occupational diseases.

The author cites the "Outline of Procedure for Industrial Physicians in Industry" which was prepared by the Council on Industrial Health of the American Medical Association and shows how such procedures apply to eye care and safety. He suggests possibilities for ophthalmological assistance and guidance to the industrial physician. His suggestions include the following: (1) Studies of the illumination of manufacturing areas, the kind of lighting that is best suited to the different occupations, the placement of fixtures and the projection of the light for best results with a minimum of fatigue to the eyes of the workers. (2) Participation in the examination procedures. This would include examination of the eyes and the glasses of the workers with a view to obtaining correction where needed and proper job placement. (3) Giving advice to employees on the care of the eyes. (4) As the medical and surgical care of eyes is limited in industry, no services in this respect are necessary beyond those which the ophthalmologist now renders. It might, however, be possible to make arrangements for an on-the-job service which would entail at least a part-time attendance at the plants. (5) Industrial ophthalmological research. (6) A goggle program. Ophthalmologists can assist in the fitting of goggles and the use of prescription lenses, etc. It is the author's contention that part-time industrial ophthalmological service should be advocated and that the medical directors of large war industries should be acquainted with the potentialities of such a service.

MARGARET H. WILTON

The Man and his Job: From War to Peace. Rodger, A.: *Oecup. Psychol.*, 1944, 18: 63.

The industrial psychologist has assumed a valued rôle in the fighting services. Personnel are selected by methods which, until 3 years ago, were adopted only by a few progressive industrial and commercial organizations. Much valuable knowledge has been acquired through accumulated experience. In this article, the author who is senior psychologist to the Admiralty, envisages how this knowledge may be utilized in the future problems of demobilization and in the development of an adequate scheme for giving vocational advice to school leavers.

At the time of demobilization advice should be available for four groups: prisoners of war; the disabled; those who had no pre-war occupation; and those whose pre-war occupations were incommensurate with their talents. Emphasis is placed on the importance of the employment interview, and on the importance of adequate and thorough "job analysis". The personnel-selection officer should be familiar with the answers to the following questions which provide a sufficient basis for the study of all occupations. (1) Does it demand any special physical capacities, or the absence of any particular defects or disabilities? (2) What preliminary educational qualifications or previous occupational experience does it require? (3) For what range of intelligence is it suited? (4) Does it call for the possession of any special aptitudes? (5) Does it suit people whose interests are in general serious or superficial? (6) Is it suited to persons who are interested in people, in books, in construction, or in physical activity? (7) Does it require any special qualities of "disposition"? Does it require any special qualities of "disposition"?

Application of this technique for the selection of personnel is equally important in the development of a satisfactory scheme of vocation guidance for boys and girls at school. The author discusses administration problems in connection with such a program and the probable rôles of the Ministry of Labour and the local education authorities. He considers the possibility of a new profession, the profession of personnel advisers, including industrial psychologists and psychiatrists, ministry of labour officials, employment officers of local education authorities, and personnel selection officers from industry.

MARGARET H. WILTON

Obituaries

Dr. George W. Beaver, aged 62, died at his home at Niagara Falls on June 23, following a week's illness.

Dr. Beaver was born in Lewiston, N.Y., and came to this city when a boy, with his parents. He was a graduate of the Niagara Falls Collegiate Institute and graduated in medicine at the University of Toronto in 1908. For several years he served as an intern at the Erie County General Hospital at Buffalo, N.Y. Later he was a government physician in the Canadian Northwest. He also practised medicine at Bradford, Pa., for three years. He came to Niagara Falls in 1917 where he had since been engaged in his profession.

He was a member of the Foresters Lodge, the Lincoln County Game and Fish Protective Association, of St. Catharines and St. Andrew's United Church.

He is survived by his widow, Mrs. Marie Ann Menig Beaver, two daughters, Mrs. R. W. Smith, of Detroit, Mich., and Mrs. Thomas J. Squires, Niagara Falls; one son, Nelson Beaver, of Detroit, Mich., and three grandchildren.

Charles Harold Bird died at his home in Gananoque on September 25. He was born in Barrie, Ont., February 13, 1872, the son of Lieut. Shearman Godfrey Bird, Royal Engineers and his wife who was a Chinese lady named Shun a Con Amoi. The last is the given

name and she was called Amy in the family circle. Dr. Bird took pride in his ancestry particularly in that of his mother.

Dr. Bird graduated M.D., C.M., Trinity, in 1893. He was gold medallist of his year and also took the qualification of Fellow of Trinity Medical College. He was intern in Toronto General Hospital for a year and began practice in Gananoque in 1896. For many years he was M.O.H. for the township of Howe Island and for several years served Gananoque in the same office. He never missed the annual meeting of the Medical Officers of Health convention if it were possible to attend.

He was examiner in medicine for the College of Physicians and Surgeons, Ontario, 1923 to 1937. He was active in the Ontario Medical Association and Canadian Medical Association, serving for some years on the Council of the former, and was keenly interested in the affairs of his own city. He was a member of the Board of Education for 30 years and was past president of the Golf and Country Club and of the Chamber of Commerce. He was an active member of Christ Church, Anglican.

Dr. Bird was a progressive and capable physician. His practice was large but he kept himself abreast with the times. His ethical conduct was always above reproach and he had well earned the tribute that his colleague Dr. J. R. Byers published in the local newspaper. He was beloved by his patients and held in respect and honour by the large circle of medical men who knew him.

His sons Dr. Harold Godfrey Bird, of Gananoque and Dr. Edward Shearman Bird, R.C.A.M.C., of Ottawa, survive him as do his wife née Bain and a daughter Mrs. J. P. Kinghorn, of Montreal. Miss Edith Bird who served as a nurse in the last war and three other sisters also survive him. There are also eleven grandchildren.

Dr. Charles E. Bouck, of Calgary, died suddenly from a heart attack at his home on July 19. He was widely known in Alberta as an accomplished surgeon. He was born at Iroquois, Ontario, the son of Mr. and Mrs. Adam Bouck. His family moved to Calgary in 1903 and he obtained part of his high school education in this city.

Graduating from Toronto University in 1911, he returned to Calgary in the same year, and in a few years established a large practice. In 1916, he joined the Canadian Army Medical Corps and served in England and in France for a period of 3 years. Before returning to Calgary he obtained his Fellowship in the Royal College of Surgeons, of Edinburgh.

Dr. Bouck will long be remembered by his many friends and patients. He was a man of abounding energy and never spared himself when the interests of his patients were at stake. Probably this altruistic desire to serve his patients thoroughly and well and at all times, hastened his demise and while he was still in his prime.

He was a member of the Kiwanis Club, the Ranchmen's Club, the Golf and Country Club, the Shrine and of the Royal Archmasons. He is survived by his widow, one daughter and one son.

Dr. William J. J. C. Brawley, of Wynyard, Sask., died on September 18 at the age of 59 years. He was a graduate of the University of Toronto (1905) and a Licentiate of the College of Physicians and Surgeons of Ontario, 1906. He registered in Saskatchewan on October 29, 1915, and has practised since that time at Wynyard.

Dr. J. George Browne, consulting physician at the Montreal General Hospital, and a senior medical examiner for M.D. 4, died October 18, at his home. He was 68.

Born in Montreal, he attended McGill University where he graduated in arts in 1898, and with dis-

tinction in medicine in 1902. He then served one year as house-surgeon at the Montreal General Hospital.

Dr. Browne was predeceased by his wife, the former Helen Ogilvie Monk. He was a member of St. George's Church, a Mason, past president of the Montreal Medico-Chirurgical Society, and a member of the University Club and the Royal Montreal Golf Club.

During the last war, Dr. Browne was attached to No. 3 Canadian General Hospital overseas and rose to the rank of lieutenant-colonel.

Surviving are three sisters, Mrs. W. W. Goodwin, Mrs. A. J. Weatherley, and Mrs. A. H. Burton. A fourth sister, Mrs. Mathew Hinshaw, died previously.

Dr. Thomas B. Fraser died suddenly at his home at Hatfield's Point, N.B., on September 16, after completing his usual hard day's work. Dr. Fraser, born in 1881 at Liverpool, N.S., graduated in medicine from McGill University in 1906. His internship was passed at the old Saint John General Public Hospital, Saint John, N.B. From 1908 till his death he lived and worked at Hatfield's Point. For thirty-six years he lived the life of the rural physician, so often glamorized in fiction and biographies, without any thought of doing more than his daily work. All he did was done well. He brought a constantly refreshed medical knowledge to the aid of a huge practice scattered widely through a large area of central New Brunswick. To say he will be missed is trite. His replacement will be difficult. To his many friends, lay and professional, his death means a personal loss not to be exaggerated. Sympathy to his family has been widely expressed. Surviving are his widow, one daughter and one son, Dr. D. B. Fraser, of London, England.

Dr. Roy Hacking, Tara, Ontario, died on March 15. He was a graduate of Toronto University (1903).

Dr. Peter S. McCaffrey. This community of Agassiz, B.C., lost one of its best loved citizens in the death of Dr. McCaffrey in Chilliwack Hospital on September 5, at the age of 61 years.

For 33 years Dr. McCaffrey had ministered to the health of a wide community. He was the doctor for the Canadian Pacific Railway from Harrison Mills to North Bend, and also for the Indian department. In the "country doctor" tradition he was not merely the medical adviser but friend and confidant of the entire district. In the early days he travelled by hand car on the railway, on horseback over the trails, and on foot when no other means would serve, to bring aid and comfort to the sick. About a year ago he had an illness and was advised to take it easy, but he was not built that way, and it may be said he wore himself out in the service of mankind.

Dr. McCaffrey took an active part in all community affairs and was president of the Agassiz-Harrison board of trade when he died. He is survived by his widow; a daughter, Miss Miriam McCaffrey, Agassiz; two sons, Major John A. McCaffrey, a medical officer with the troops in Italy, and Dr. Robert McCaffrey, Toronto; and two brothers, both doctors, one at Chilliwack and the other at Princeton.

Dr. C. J. A. McKillop, St. Thomas, Ontario, who was born in 1891 and a graduate of the University of Western Ontario died on September 24.

Capt. Harry Marantz, R.C.A.M.C., medical officer of the Queen's Own Cameron Highlanders, was killed in action in France, August 15. After graduating from the University of Manitoba in medicine (1931), he practised for 2 years at Steinbach, then 8 years at Flin Flon, Manitoba, where he was also health officer and coroner. After enlisting in July, 1941, he was stationed at M.D. 10, Winnipeg, before going overseas in May, 1942. He is survived by his widow, a son and a daughter.

Dr. J. W. Messecar, of Mille Roches, Ontario, died on September 10. He was born in 1871 and graduated in medicine from Toronto University in 1898.

Dr. Charles Richard Llewellyn Morgan, of Hamilton, a 1914 graduate of McGill University died on June 17 at the age of 51.

Dr. Archibald D. Naismith, Straffordville, Ontario, died in his 92nd year on August 24. He studied medicine at the University of Toronto where he graduated in 1883.

Dr. Richard Parsons died suddenly following a heart attack in Calgary on August 25, where he had come to attend a meeting of the Council of the College of Physicians and Surgeons. He was 69 years of age, and had practised in Red Deer since 1903.

He was born near Weston, Ontario. Following graduation in medicine from Trinity College, Toronto, in 1901, he interned at the Toronto General Hospital.

He served 3 years with the Canadian Army Corps in the last war in England and in France. He was Canadian Pacific Railway surgeon at Red Deer from 1906 to 1944. In 1917, he obtained his F.R.C.S., Edinburgh. He was a Fellow of the Royal College of Surgeons of Canada as well as of the American College of Surgeons. He was a past president of the Alberta Medical Association in 1930; a member of the Council of the College of Physicians and Surgeons for more than 20 years. He was held in high esteem by our profession in this Province. He is survived by his widow and two sons: Dr. R. McGregor Parsons, of Red Deer, and Capt. William B. Parsons, radiologist, serving with the R.C.A.M.C., at Regina, also by two daughters.

Dr. William Hercules Rice died in Sydney, N.S., on September 26, after a long illness. He was 72 years of age.

Born in Montreal, he graduated in 1900 from Trinity University, Toronto. He came to Sydney to practise about a year later and continued to do so actively until his retirement, due to ill health, about two years ago.

Dr. G. W. Robinson, of Arkona, Ontario, died on July 19. He was born in 1902 and studied medicine at the University of Western Ontario. He graduated in 1927.

Dr. R. T. Rutherford, Ajax, Ontario, who was in his 71st year, died on August 25. He was a graduate of Trinity College in 1897.

Dr. A. G. Shiell, of Kitchener, graduated in medicine from University of Western Ontario in 1918. He was born in 1891 and died on September 8.

Dr. W. O. Simpson, Toronto, died on September 25. He was a graduate of Trinity College (1899).

Dr. Arthur T. Spankie died in Calgary on September 11, after a prolonged illness at the age of 59 years. He was the son of the late Dr. Spankie, of Kingston, Ontario, for many years a member of the House of Commons.

Dr. Spankie graduated from Queen's University in 1907, and then spent three years at the Manhattan Eye, Ear, Nose and Throat Hospital, New York. He came to Calgary in 1910 and practised in his special work until about a year ago when his illness was slowly increasing in severity. He was for many years specialist in eye, nose and throat work to the public schools in Calgary. He leaves a widow and a daughter to mourn his loss.



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News Items

Alberta

Some members of the Chiropractors Association in Alberta, following the decision of the National Association, endeavoured to have legislation passed in Alberta, so that all future Alberta registrants would have of necessity a 4 year course in a Chiropractic College before being eligible for Alberta registration. Strong representations have been made against this move so it will not likely be made.

According to a ruling of Mr. Justice Shepherd, of Calgary, in a case where a physician in Edmonton was suing to be reinstated as a member of the hospital medical staff, the Board of a hospital cannot refuse standing to a resident physician unless it has good reasons that would be acceptable to the Court for its actions. This in face of the fact that the Hospital Charter gives the Board full authority to choose the members of such staff. Whether this judgment will be appealed is not known at the present time.

According to the recent amended regulations of the Department of Pensions and National Health, a physician in emergencies may telephone a prescription for cough mixtures containing codeine and have them filled, but he must deliver the written prescription within 36 hours. These prescriptions may not contain more than two grains of codeine, however. While this amended ruling is better than the former regulations, the limit of codeine in a cough mixture or similar preparations seems to the profession in Alberta to be too small.

Due to the fact that physicians are so busy, with 150 of our profession in the Forces, no district meetings will be held, out of the cities in Alberta this year. They have not time to attend them and visiting clinicians have not the time to prepare the papers. Thus the only scientific meetings were the annual refresher course held at the University Hospital in May and the meeting of the Canadian Medical Association, Alberta Division, in September.

An action has been commenced by an osteopath against the Registrar of the College of Physicians and Surgeons of Alberta in an attempt to establish the rights of the former to practise as a regular physician in Alberta.

The members of the medical profession of Alberta are wondering what will be the effect on the proposed treatment of returned soldiers for the first year after their discharge under the suggested regulations by the Government. It would appear as though medical service could be received only by applying to a district representative of the Department of Pensions and National Health. In a great many cases, the local physicians will not be the representatives and the ailing soldiers will have to travel many miles to see the official representatives and thus will not be able to have the family physicians' care. It would therefore seem that the returned medical men, who will be going to various places where they have had no doctors during the war period, will have taken from them a large share of their expected practice.

The Council of the College of Physicians and Surgeons of Alberta is pressing the Workmen's Compensation Board for payment for first reports on injured workmen of all cases, whether the case is finally accepted as one coming under the jurisdiction of the Board or not. The Compensation Act states "A physician who attends an injured workman shall forward to the Board, . . . (a) a report within two days after

the date of his first attendance upon the workman". As this information is necessary for the Board to enable it to be sure of its responsibility in the case, and as the Act compels a physician to report, this must provide for his remuneration for making such a report.

In Alberta, there are protests against the manner in which the succession duties' Department handles a doctor's estate. They estimate the value of the uncollected accounts far too high, and sometimes based on this estimate, the succession duties are out of all proportion to the value of the estate. Doctors are being urged to see that only accounts of reasonable collection possibilities are kept in their ledgers. Those that are of no value should be written off. Further, it is noted that uncollected accounts of a physician are very poor assets on his death, and should be so calculated, in settling the estate.

As conditions under which municipalities could have the services of men in the Forces, brought over from Europe, were found to be too cumbersome, no municipality in Alberta seemed willing to accept them.

G. E. LEARMONT

Manitoba

Lieut.-Col. C. E. Corrigan, R.C.A.M.C., has recently been awarded the Distinguished Service Order. While commanding a light field ambulance in Italy he and his colleagues worked a 48-hour stretch to care for the wounded. His many friends in Manitoba are pleased, but not surprised, that this honour has come to Eddie Corrigan. Prior to the war he was teaching clinical surgery with the rank of assistant professor in the University of Manitoba and engaged in an active surgical practice. He went overseas in 1939 with the P.P.C.L.I. with the rank of captain. On the Italian front he was second-in-command of the 9th Field Ambulance at Ortona, and later took command of a field dressing station.

Dr. Harry Coppinger, superintendent of the Winnipeg General Hospital, attended the annual meeting of the American Hospital Association at Cleveland, Ohio, September 30 to October 6.

The Manitoba Hospital Service Association as agent, is now selling contracts for medical care to be supplied by Manitoba Medical Service. This non-profit prepayment scheme is sponsored by the Manitoba Medical Association and aims to give medical care to persons in the lower income brackets. The directorate of Manitoba Medical Service is now composed of 21 members, 7 of whom are prominent business or labour officials, and 14 are medical men appointed or elected by the Manitoba Medical Association.

Dr. W. A. Gardner, honorary president of the Manitoba Medical Students Association, gave the inaugural address, September 13 at the opening of Manitoba Medical College's fall term.

ROSS MITCHELL

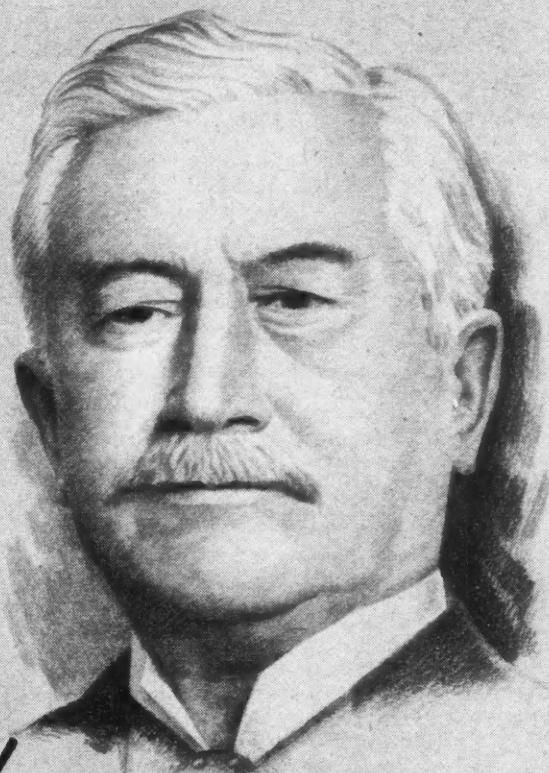
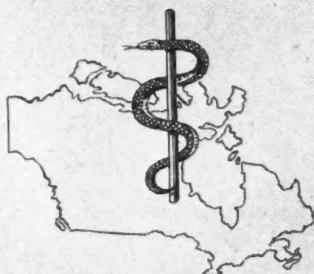
New Brunswick

Two members of the staff of the Saint John General Hospital who are extra mural members of the Dalhousie Medical School, Halifax, appeared as speakers on the Refresher Course October 9 to 13. Dr. D. J. Tonning lectured on "Methyl alcohol poisoning", a survey of some thirty cases and Dr. George F. Skinner's paper was "Resection of duodenum and pancreas for carcinoma of ampulla of Vater".

Dr. C. L. Emerson has resigned as District Medical Health Officer for Saint John District. Dr. Emerson's services have been voluntary for the past year.

FATHERS OF CANADIAN MEDICINE

*ONE OF A SERIES



Sir Thos. Roddick

M.D. (1846-1923)

BORN at Harbour Grace, Newfoundland, on July 31st, 1846, Roddick was educated at the Normal School, Truro, N.S., and during his studies found time to attend the surgery of Samuel Muir of Truro, from whom he obtained a certificate that he had spent from December 3rd, 1861, to March 15th, 1863, following the routine of a general practitioner's duties. He registered at McGill University on July 31st, 1864. There he had a brilliant career, winning both the final prize and the Holmes medal.

Following his graduation, Roddick practised in Montreal. In 1875 he became Professor of Clinical Surgery at McGill University. He continued his studies in Edinburgh and on his return to Canada introduced Lister's antiseptic methods. During the Riel Rebellion, he was Deputy Surgeon General of the Canadian Militia and won a reputation as one of the most distinguished of Canadian surgeons.

In 1897, Roddick was signally honoured by being chosen President of the British Medical Association, the first medical man outside the British Isles to hold the position. In 1900 he received an Honorary Fellowship of the Royal College of Surgeons of London.

Sir Thomas was Dean of the Faculty of Medicine

at McGill from 1901 to 1908 and represented Montreal West in the Dominion House of Commons from 1896 to 1904. His greatest achievement was the passage by Parliament of the Roddick Bill which gave national registration to medical students. The crowning glory of Roddick's career was his knighthood in 1914. He died on February 20th, 1923.

Dr. J. J. Heagerty referring to the Canada Medical Act writes: "The aims of the Act were the establishment of national registration, the creation of a Canadian medical register, and the maintenance of medical practice in Canada at so high a standard that recognition could be obtained in the United Kingdom enabling Canadian practitioners to acquire the right of registration under 'The Medical Acts' of Great Britain."

A brilliant surgeon, educator, parliamentarian, Knight Bachelor, honoured by Edinburgh, Oxford and Queen's Universities, Roddick's example in helping to establish a sound foundation and respect for the practice of medicine in Canada inspires this organization to reaffirm its faith in the Warner policy — Therapeutic Exactness — Pharmaceutical Excellence.

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1856 - 1944

With an advance in rank from Lieut.-Col. to full Colonel and reporting to an appointment as senior consultant in medicine, Col. A. B. Walter, R.C.A.M.C., has removed from the Maritimes to Upper Canada.

Dr. Charles McKay, of Fredericton, has been a patient at the Victoria Public Hospital for some time due to a heart ailment. It is reported that his condition shows improvement.

The Moncton Hospital has ordered x-ray equipment to the value of \$18,500. This expansion follows the appointment of Dr. Howard Ripley as radiologist in this hospital.

Dr. H. A. Farris, of Saint John, has completely recovered from an operation for mastoiditis and is again in practice and on service on the hospital wards.

Dr. A. L. Donovan, of Saint John, is at present in Boston doing special work in cardiology.

New Brunswick with the rest of Canada is undergoing an energetic campaign to reduce the incidence of venereal disease, both in civilian and armed population. The province has had the advantage of a visit by Lieut.-Col. Williams and the continued services of Major Monks, specialists in venereal disease control of the R.C.A.M.C.

The Commissioners of the Saint John Tuberculosis Hospital are engaged in a rather drawn out negotiation with the Federal authorities concerning grants in aid to the hospital from Ottawa as assistance in a building program to provide new beds for the treatment of patients with tuberculosis referred from the armed forces.

Dr. V. D. Davidson of the surgical staff of the Saint John General Hospital and Lancaster Military Hospital has returned to work after a short bout of pneumonia.

Dr. F. A. McGrand, of Fredericton Junction, has been sworn in as Minister of Health in the new Cabinet of the New Brunswick Legislature. The Hon. Dr. McGrand was speaker of the House during the last administration.

It is reported that building of a sixty bed hospital at Dalhousie, will commence next spring.

A. STANLEY KIRKLAND

Nova Scotia

Surgeon-Lieutenant Hugh Malcolm Henderson is reported as missing following naval operations. Formerly of Truro, he received his degree from Dalhousie in medicine on January 5, 1943.

The many friends of Dr. H. D. O'Brien, of Halifax, will be pleased to learn of his promotion to the rank of Lieutenant-Colonel. Early in the war Dr. O'Brien joined the staff of No. 7 Canadian General Hospital and after a period of service at Cogswell St. Military Hospital, Halifax, and at Debert Military Hospital, left for England in 1941. He has seen service in England and Sicily and is at present surgeon-in-chief in one of the Canadian General Hospitals in Italy.

Dr. C. B. Crummey, who for the past several years practised at Trenton, Nova Scotia, has left the Province and will practise in Toronto in future. His appointment with the Nova Scotia Steel Company as industrial physician will be taken over by Dr. J. C. Ballem, of New Glasgow.

The Dalhousie Medical School, due to the accelerated course in Medicine, will have no 4th year class this

session. The 1st year in Medicine, however, is over-subscribed, there being over 100 eligible applicants of which 50 were accepted. The opening of the new anatomy department will be one of the features of the postgraduate course held under the auspices of the University during October.

H. L. SCAMMELL

Ontario

The Academy of Medicine, Toronto, opened its session for the new year on October 3, 1944. The president, Dr. J. Z. Gillies presided at dinner and introduced the invited guests. President Cody of the University of Toronto was on Dr. Gillies' right and Dr. Fred Conboy, mayor of Toronto, on his left. Representatives of the armed forces, the Academy of Medicine in Hamilton, the Academy of Dentistry were at the head table as were Dr. Harris McPhedran, President of the Canadian Medical Association, Dr. T. C. Routley and the Dean of the Faculty of Medicine, University of Toronto, Dr. W. E. Gallie.

President Cody gave a rapid review of the work done in the Faculty of Medicine during the year. His story of the activities of the Connaught Laboratories was a revelation. In the 70,000 square feet of floor space in the old building formerly used by Knox College the manufacture of penicillin and the processing of blood has become a great industry. Twenty thousand donations of blood per week are being prepared for overseas shipment and penicillin has now reached the stage in which a surplus is available for civilian needs. Forty-nine biological products are being manufactured in the various plants associated with the Department of Hygiene and are distributed in 365 sorts of packages. A total increase in manufacture of 31.9% has been made in the past year and shipments are up by 57%.

The inaugural address was read by Dr. Gillies who reviewed the history of the academy and its library which now contains over 30,000 volumes. He described the quandary in which the Academy now finds itself as the present Academy building must be vacated before next February. To find temporary quarters before that date will be very difficult. The problem of finding a permanent home for the library is even more difficult. The council is inspired by a motto in the Connaught Laboratories which President Cody has done into Latin *difficilia nunc impossibilia tunc* which the council interprets as taking a little longer to accomplish what did appear to be beyond their abilities. The meetings will be continued in hospital lecture rooms or other available meeting places. There may evolve a scheme by which the Academy, the College of Physicians and Surgeons and the Canadian and Ontario Medical Associations would share a suitable building which would properly house the library and the museum of the Academy.

The annual district meetings of the Ontario Division of the C.M.A. are being held throughout the Province. Already large and enthusiastic meetings have been held in Port Arthur and Fort William on September 5. In Sault Ste. Marie on September 7, in Ottawa on September 20, in Simcoe September 27 and in London October 3 and 4. The programs have been well prepared and the next annual convention will reflect the spirit of unity of purpose manifested in the district meetings.

Dr. Harris McPhedran, President of the C.M.A., has returned from his tour of the west. He was accompanied by a team of lecturers who read scientific papers at the meetings and gave popular lectures in some of the cities visited. Dr. W. Magner, of Toronto, was one of this group.

The Toronto East General Hospital combined the graduating exercises of its nursing school with the ceremonial opening of a new wing of 200 beds on



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September 30. On Sunday October 1 open house was held and the Ladies Auxiliary served tea in the new Nurses' Dining Room. This room is unique in the richness of its furnishing. A cafeteria service counter is in a wide corridor at the entrance to a large room with a lounge in a wide alcove at the opposite end. Lighting is indirect. The large shield under the lamps and the walls of the room are decorated in pastel colors and the floor is covered by an immense rug specially designed to match the walls. This room is so convenient to the hospital and so admirably suited for meetings of various kinds that one wonders if the nurses may not be often crowded out of their sumptuous dining room.

The room referred to is over the admitting department which is designed on most modern lines. Ambulances enter the building by a large doorway and go out by another so that loading and unloading are done inside the hospital.

Quebec

Fear that the general public might be exploited by insufficiently trained psychologists, was expressed recently by Dr. K. E. Norris, president of the newly-formed Psychological Association of the Province of Quebec, who pointed to the great increase of interest in the general field of psychology and in applied psychology, particularly by industry.

The association has set up a committee on training and certification upon which will rest the responsibility for examining the credentials of those who desire to become members of the association. It is held that there was no quick way to become a qualified psychologist. For example, in the army it had been found that a minimum of six weeks full-time concentrated training was required before selected men with the correct educational background could become qualified merely to administer intelligence and aptitude tests, and that for a considerable period after this training, they did such work under the direct supervision of a qualified psychologist. The interpretation of such tests, and the use of their results in guidance and personnel selection, required a further period of training and supervised practice.

A temporary halt has been decided upon in the taking of application for membership in the association, it was stated by Dr. Norris. There has been a great demand by professional workers in the psychological field for recognition by the association, he continued. One of the objectives of the association is to certify the qualifications of those acting as psychologists and giving psychological tests, and to act in the same capacity regarding psychologists as do similar professional organizations for the medical, engineering and other professions.

Three divisions of membership have been decided upon into which applicants may be placed. These are: Full members, who must have graduate degrees in psychology or be fully qualified through training and experience; associate members, for which academic degrees are not a prerequisite, but who must be actively engaged in the psychological field or its applications; and student members, who are in the process of training for the psychological profession or its applications.

Dr. A. D. Campbell, Associate Professor of Obstetrics and Gynaecology of McGill University and Chief of the Department of Gynaecology at the Montreal General Hospital, has been chosen as President-Elect of the American Association of Obstetricians and Gynaecologists and Abdominal Surgery. The election was announced at the annual meeting of the Association in Hot Springs, Va., last September.

It is 48 years since a Canadian has been honoured with this position.

The Montreal Neurological Institute has completed its tenth year. During that time 375 articles and books on scientific subjects have been published by the staff members. Sixty-six graduate students have served as research fellows. These came from Canada, United States, England, Scotland, Spain, Norway, Hungary, Poland, Russia, Germany, New Zealand, Australia and China. During recent years research was directed largely to military medicine which however, has still to remain unpublished.

Available space has long been overcrowded, almost to the breaking point. This has been due to demands for treatment from Canada's combatant services, and for this reason neurology has sometimes been crowded by neurosurgical cases. Alterations are under way which will enlarge operating and x-ray units but will, unfortunately, crowd the research fellows. The Department of National Defence proposes to build a temporary annex for army casualties, but this is a temporary expedient which will leave unsolved problems of accommodation after the war.

The Seventh Annual Louis Gross Memorial Lecture was delivered at the Jewish General Hospital, Montreal, on October 2 by Dr. Leo Loewe, of New York. The subject was "Further observations on the combined use of penicillin and heparin in the treatment of subacute bacterial endocarditis".

Saskatchewan

A new registrant of the Saskatchewan College is Dr. George F. Kipkie, Queen's 1939, of Regina.

Col. Beattie Martin returned to Regina on October 3 after extensive service overseas with the R.C.A.M.C.

The defence department announced promotion to rank of acting lieutenant-colonel for Major M. D. Mitchell, R.C.A.M.C., Maple Creek, Saskatchewan, who has been camp medical officer at Chilliwack, B.C. He has been appointed to command Shilo camp military hospital and to be camp medical officer at Shilo Camp, Man.

Some 174 medical men registered at the Saskatchewan Annual Medical Convention in Saskatoon at the Bessborough Hotel, September 18 to 20. The C.M.A. team of speakers, including the President, Dr. Harris McPhedran, and the General Secretary, Dr. T. C. Routley, added much to the success of the meetings. On Wednesday morning a clinic was held at St. Paul's Hospital. . . . It was followed by a luncheon at which those attending were guests of the Hospital staff. All medical officers attending the Convention were the guests of the Saskatoon and District Medical Society. It was decided that the 1945 annual convention would be held in Regina with the Moose Jaw medical men joint hosts.

H. D. HART

General

Premier Mackenzie King has announced the appointment of ministers for three new departments of government. The appointments are as follows:

Hon. C. D. Howe becomes Minister of Reconstruction, in addition to being Minister of Munitions and Supply.

Hon. Ian Mackenzie, heretofore Minister of Pensions and Health, heads the new Department of Veterans' Affairs.

Hon. Brooke Claxton, of Montreal, newly appointed to the Cabinet, is the Minister of National Health and Welfare.

Linked up with the announcements was acceptance of the resignation long ago tendered by General McNaughton of his position as head of the Research Council and the appointment in his stead of Dr. C. J. Mackenzie, acting director for the last four years.

PENICILLIN . . .



To assure that Penicillin would be available for the needs of the Armed Services of Canada, the Dominion Government made possible, a year ago, the establishing of two production plants, one of which was in the Connaught Laboratories.

Production was commenced in the Connaught Laboratories within seven months and to-day large quantities of Penicillin of high quality are being produced.

The entire amount of Penicillin produced in the Connaught Laboratories is allocated to the Armed Services.

As soon as circumstances permit, Penicillin prepared by the Connaught Laboratories will be available for civilian distribution in Canada.

CONNAUGHT LABORATORIES
University of Toronto Toronto 5, Canada

This branch is now transferred to the Reconstruction Department from Trade and Commerce.

Progress of Disabled Impeded by Thoughtless Civilians.—Disabled soldiers being prepared for their return to civilian life are seriously hampered in their efforts to adjust themselves by the morbid curiosity and thoughtlessness of some civilians, according to Staff Sergeant Robert K. Yandell, who lost a leg in the World War and is now instructing amputation cases at Walter Reed General Hospital, Washington, D.C.

A leg amputee is taught how to camouflage his prosthesis by balancing exercises, special shoulder and arm movements in walking, placing his feet in certain positions when he sits down or rises, and by many other means which help to avoid drawing attention to his disability. All the hours spent in this practice are nullified if people embarrass the men by stares and prying questions. The Army Medical Department has appealed to the public for understanding and co-operation in this respect.—Technical Information Bureau, Washington, D.C.

Infantile Paralysis in the United States.—The peak of the 1944 epidemic of infantile paralysis for the nation as a whole apparently has been passed, and the incidence of the disease is now tapering off, according to the latest reports received by the National Foundation for Infantile Paralysis, up to September 17. The heaviest incidence of cases for the United States occurred in the week of September 2 when 1,683 cases were reported to the U.S. Public Health Service. The week of September 9 showed a drop to 1,487, and reports since then from epidemic states indicate the decline is continuing. The total for the year up to September 9 was 10,959 cases, or more cases for the comparable period than at any time since America's worst epidemic year in 1916.

This year's total for the first 36 weeks is 2,030 cases higher than for the same period in 1931, which to date is the second highest epidemic year.

In combating the epidemic, the National Foundation has sent out 7 doctors, 50 physical therapists and more than seven tons of wool as well as emergency financial relief. The American Red Cross has recruited approximately 700 nurses to supplement local facilities in epidemic areas.

The returns on hand at the Bureau of Statistics at the time of the issue of this report (in September, 1944) show the following figures for the whole year of 1943, with 1942 figures in parentheses: live births, 281,391 (272,313); birth rate, 23.9 (23.4); illegitimate births, 11,312 (11,088); percentage of total live births, 4.0 (4.1); stillbirths, 6,933 (7,132); rate per 1,000 live births, 24.6 (26.2); deaths, 119,080 (112,978); death rate, 10.1 (9.7); natural increase, 162,311 (159,335); rate of natural increase, 13.8 (13.7); deaths under one year, 15,069 (14,651); rate per 1,000 live births, 54 (54); deaths under one month, 8,289 (7,653); rate per 1,000 live births, 29 (28); maternal deaths, 769 (818); rate per 1,000 live births, 2.7 (3.0); marriages, 110,941 (127,372); marriage rate, 9.4 (10.9).

Deaths from certain causes for the year 1943 as compared with the corresponding figures for 1942 were as follows: typhoid and paratyphoid fever, 113 (108); scarlet fever, 98 (129); whooping cough, 415 (560); diphtheria, 285 (256); tuberculosis, 6,022 (5,980); influenza, 2,318 (1,227); smallpox, (....); measles, 189 (131); acute poliomyelitis and polioencephalitis, 26 (64); cancer, 13,826 (13,654); intracranial lesions of vascular origin, 9,038 (8,728); diseases of the heart, 28,464 (27,529); diseases of the arteries, 2,438 (2,270); pneumonia, 6,161 (5,778); diarrhoea and enteritis, 1,859 (2,400); nephritis, 7,367 (7,233); suicides, 744 (839); homicides, 114 (113); motor vehicle accidents, 1,397 (1,409); other accidental deaths, 5,707 (5,793).

UNRRA Need for Medical Personnel.—The Health Division of the United Nations Relief and Rehabilitation Administration has undertaken the challenging task of assisting the peoples of liberated countries to achieve at least the minimum of health and sanitation standards which will enable them to carry forward successfully the job of reconstruction.

The war has created the conditions for a wide variety of medical problems ranging from the treatment of wounds to communicable diseases and nutritional deficiencies. To meet these problems, UNRRA is in need of well qualified personnel in both the fields of clinical medicine and public health and administration. The actual work will range from clinical medicine in hospitals and clinics to public health in the field. Persons with administrative ability will be needed to properly organize the indigenous resources of the countries receiving assistance.

Plans are being made to send mobile medical teams into the field ready to combat epidemics and other medical emergencies. Special programs have been formulated in the fields of tuberculosis control and nutrition. Among other things mobile photo-fluorographic x-ray units will be used in tuberculosis control.

UNRRA missions will go into various liberated areas of Europe, including the Balkans and Italy. Plans are already under way for work in the Far East. Individuals will be assigned to locations depending upon their qualifications, knowledge of languages, and the need at the time they are assigned.

Compensation for medical officers ranges from \$4,000 to \$7,000 annual base pay, in addition to which a subsistence allowance is given while overseas. In addition to physicians, there is a need for nurses, both public and clinical, bacteriologists, laboratory technicians, pharmacists, medical supply officers and other types of medical personnel. A knowledge of foreign languages is not essential, but of course is desirable.

Properly qualified members of the Canadian Armed Forces for whom there are positions available in UNRRA may be released by consultation with the appropriate authorities. Those interested may request applications and further information by communicating with United Nations Relief and Rehabilitation, 1344 Connecticut Avenue, N.W., Washington, D.C.

Book Reviews

Physical Medicine in General Practice. W. Bierman. 645 pp., illust. \$7.50. Hoeber, New York, 1944.

This book is a concise readable account of all types of physical treatment used in general practice. Sufficient technical detail is included for the average practitioner although perhaps the specialist in physical medicine might desire a little fuller treatment of the various physical theories involved. In most cases the simplest and best technique has been described thus eliminating a large amount of unnecessary repetition. There is a minor typographical error on page 313 where the quantity drachms 1 is given instead of ounces 1 in a prescription. Apart from this the book is singularly free from typographical errors and its format does credit to the publishers. Among the outstanding features are a complete discussion of hydrotherapy, spa therapy, the Kenny treatment of poliomyelitis, the use of cold, and manipulation. The illustrations of which there are over 300 deserve special mention as they clearly delineate the techniques used and eliminate extensive verbal descriptions. Being line drawings they are not overcrowded with detail but each one makes its point without an extensive legend.